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THE WORLD'S RECENT PRODUCTION OF GOLD AND ITS INFLUENCE UPON COMMODITY PRICES.

By Francis B. Forbes.

My purpose is to trace, as far as possible, the absorption, in different ways, of the world's output of gold during the ten calendar years 1895–1904, and to investigate the effect of this unprecedented influx of the metal upon the general level of prices.

It will be convenient to discuss, in the first place, the movement of prices; and I shall take English prices as the nearest obtainable approach to what we understand by the general level, for the following reasons:—

In a broad sense, imports are admitted into Great Britain *duty free*, so that no allowance has to be made for any customs impost, whether protective or otherwise. The English market, indeed, is not merely the only one of great distributive energy, where prices are not influenced by local tariffs, but its radius of operations touches every trading point on the globe. Accordingly, the "higgling of the market" in England must indicate the approximate resultant of the world's commercial competition at any given moment; and the curves of English wholesale quotations

through any period must be the best obtainable reflex of a rise or fall in the general level of prices.

This movement of English prices will be compared with the corresponding one in the United States by a method which, as far as I know, has not hitherto been employed. Then, after summarizing the statistics of the production and absorption of gold, I purpose to investigate the causes which have tended to give the new gold a greater influence in advancing prices in the United States than has been observable elsewhere.

For what concerns England, I adopt the well-known index-numbers of Mr. Sauerbeck, because I believe them to be very generally used, and because they are more familiar to me than other English systems.

Mr. Sauerbeck has carefully selected for quotation 45 commodities, which, however, appear in his tables as 56 numbers. The importance of each commodity has been well considered, and none have been admitted the annual consumption of which in the United Kingdom is less than £1,000,000. The basis of his index-numbers is the average of wholesale prices for the eleven years 1867–77, such average for each commodity, or group of commodities, being taken as 100, and the number for any given year being a percentage of the corresponding average for the standard period. For each year prices are (with one exception) the average of monthly or weekly quotations, and not those at given dates (say January 1 and July 1), according to the method of the London *Economist*. The records go back to the year 1846.

Mr. Sauerbeck divides his 56 numbers into two categories of "Food" and "Materials," "Food" having three groups of "Vegetable Food," "Animal Food," and "Sugar, Coffee, and Tea," while under "Materials" there are also three groups of "Minerals," "Textiles," and "Sundry Materials." As to the second category, it is to be remarked that all the commodities selected are the raw materials of great indus-

tries, although they have been to some extent "manufactured" before reaching the market.

Table I (see Appendix) gives a summary of Mr. Sauerbeck's index-numbers for the years 1890–1904. The averages for 1890–99 have been added by me.

As the movement of prices in the United States is of more immediate concern to us, I give the results of two systems, differing widely in method, but approaching so closely in some ways that a comparison of their details will not be without interest.

(1) *The Index-Numbers of the Bureau of Labor.*

These tables were started in 1902, when the Hon. Carroll D. Wright was Commissioner, and have been regularly continued since then. The general plan is admirable, and the details are so clearly worked out that the student finds no difficulty in rearranging the figures as may be required for any special purpose.

Wholesale prices are quoted, with index-numbers, for a large number of commodities, beginning with 251 in 1890, and rising to 259 or 260 up to date. The base-prices are the average, for each commodity or group, of the ten years, 1890–99 (taken as 100); and any given index-number is a percentage of the corresponding price for the standard period. No figures are given for earlier than 1890.

Nine groups of very unequal importance are used to classify the many commodities, the following being the arrangement for 1904: Farm Products, 16 articles; Food, etc., 53 articles; Cloths and Clothing, 76 articles; Fuel and Lighting, 13 articles; Metals and Implements, 38 articles; Lumber and Building Materials, 27 articles; Drugs and Chemicals, 9 articles; House Furnishing Goods, 14 articles; Miscellaneous, 13 articles. Total, 259 articles.

Table II (see Appendix) gives a summary of the Labor Bureau index-numbers for the years 1890–1904.

(2) *Messrs. R. G. Dun & Co.'s Index-Numbers.*

These tables have been published monthly in *Dun's Review* since January, 1901, and were designed by the authors to give "the cost of a year's supplies of all the necessaries of life" for a single individual. They are based upon wholesale quotations, that for each commodity being "multiplied by the annual per capita consumption, which precludes any commodity having more than its proper weight in the aggregate."

It must be noted that only a general idea is given of some 350 articles selected, and that there are no details either of the method of calculating the "annual per capita consumption" or of its coefficient in each case. No analysis of these tables can, therefore, be carried very far; but Messrs. Dun's index-numbers seem to represent the sum of money which the "per capita consumer" has had to pay for identical quantities of the selected commodities at different dates. The worst of it is that Messrs. Dun's "per capita consumer" must be very like Mr. Dooley's "average man,"—the person "we most seldom meet,"—so that it is not always easy to guess how figures about him will apply to the rest of us. Still, Messrs. Dun's tables have an unquestioned value and interest of their own.

Their 350 commodities are divided into seven groups, none of which is specifically described, nor is there any guide to the number of commodities classified together, beyond the relative importance of the group itself as measured in dollars.

As some indication of these relations, I give Messrs. Dun's figures for January 1, 1906:—

(1) Breadstuffs, $16.55; (2) Meats, $8.43; (3) Dairy and Garden Products, $14.40; (4) Other Food, $9.82; (5) Clothing, $19.31; (6) Metals, $17.14; (7) Miscellaneous, $18.81; total, $104.46. The prices may be summarized as follows:—

Food (1 @ 4)	$49.20
Other than Food (5 @ 7)	55.26
	$104.46

Messrs. Dun's general statistics go back to January 1, 1860, and monthly quotations have been given for several years past, but no averages are made; and the authors themselves suggest that their figures for July 1 of each year are their best index of the general movement of prices.

Table III (see Appendix) gives a summary by groups of Messrs. Dun's index-numbers on July 1 of every year from 1890 to 1904. The columns for "Total Food" and "Total other than Food" have been added by me.

An inspection of these three tables will show several interesting points of difference.

(1) The proportion of "Food" to "Other than Food" articles is much greater in Messrs. Dun's tables than in either of the others.

(2) The proportion of "Food" articles to the total is by far the smallest in the Labor Bureau's tables.

(3) The proportion of articles in the production of which highly skilled labor is required is very large in the Labor Bureau tables, and must be of considerable importance in Messrs. Dun's. Mr. Sauerbeck's method takes practically no account of such articles.

Beyond all these, there stands the more important fact that the three sets of statistics represent different methods of construction. The index-numbers of Mr. Sauerbeck are based upon the averages of one period of years, and those of the Labor Bureau on the averages of another, while Messrs. Dun's yearly figures (though the relation of one year to another is easily calculated) can hardly be called "index-numbers" at all, in the usually accepted sense of the term.

After repeated attempts, I found that only misleading results could be got by bringing together either the three sets of figures or their respective statistical curves. The only practical way of reaching some kind of uniformity seemed to be to take as base-prices for each system its own averages for the years 1890–99 (those already adopted by the Labor Bureau), and to calculate new sets of index-numbers as

percentages of those. I do not remember having seen this method used for similar work, but I believe it will bring out all the salient facts needed for the present investigation.

Table A compares the general course of English prices with American prices during the fifteen years 1890–1904, by means of my new index-numbers for the total annual figures of each system.

TABLE A.

COMPARISON OF AMERICAN AND ENGLISH GENERAL INDEX-NUMBERS FOR THE YEARS 1890–1904.

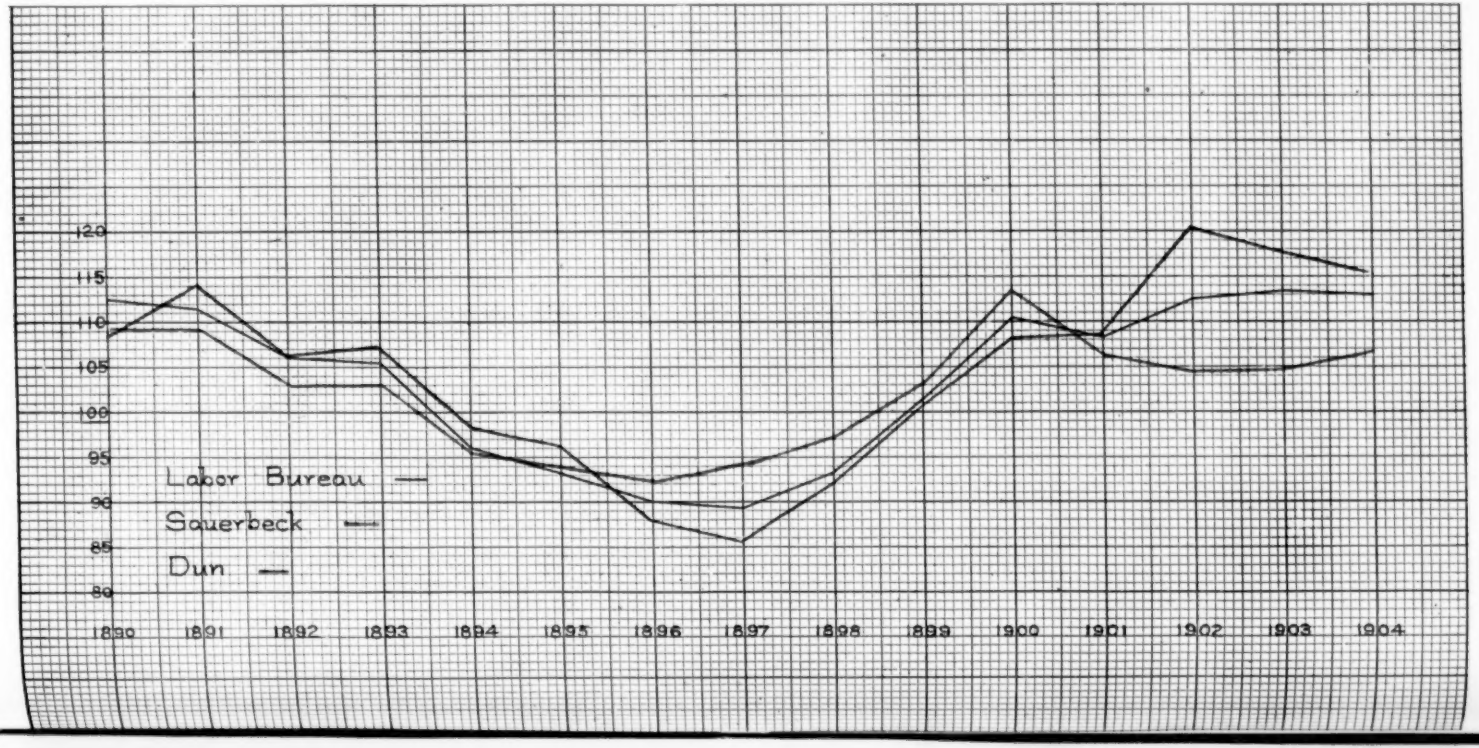
Years.	American.			English.	
	Labor Bureau.	Dun's.		Sauerbeck's.	
	Original Percentages.	Original Numbers July 1.	Comparative Index-Numbers.	Original Numbers.	Comparative Index-Numbers.
Average of 1890–99.	100	$84.28	100	66	100
1890	112.9	$91.56	108.6	72	109.1
1891	111.7	96.10	114.	72	109.1
1892	106.1	89.99	106.8	68	103
1893	105.6	90.62	107.5	68	103
1894	96.1	83.30	98.8	63	95.5
1895	93.6	81.51	96.7	62	94
1896	90.4	74.31	88.2	61	92.4
1897	89.7	72.46	86	62	94
1898	93.4	77.76	92.3	64	97
1899	101.7	85.23	101.1	68	103
1900	110.5	91.41	108.5	75	113.6
1901	108.5	91.51	108.6	70	106.1
1902	112.9	101.91	120.9	69	104.5
1903	113.6	99.46	118	69	104.5
1904	113	97.19	115.3	70	106.1

An inspection of Table B, which gives the same movement of prices in statistical curves, shows a marvellous correspondence of all three down to the years 1896–97, when the lowest points were reached. It may be mentioned that the English curve during these years simply prolonged a downward course, which had been continuous since 1874.

TABLE B.

COMPARISON OF AMERICAN AND ENGLISH GENERAL INDEX-NUMBERS.

For each curve 100 represents average of the years 1890–99.



As to the United States, the Labor Bureau gives no figures earlier than 1890; but Messrs. Dun's tables, which go back to 1860, demonstrate the futility of comparing present ranges of prices with anything before our resumption of specie payments in 1878. From that point down to 1890 a general decline is apparent, with, however, a marked advance during the four years 1880–83, for which Messrs. Dun's figures make "Breadstuffs" and other "Food" products mainly responsible.

The lowest English point was touched in 1896, and for both the American tables in 1897. The American decline was the more pronounced; but the similarity of all three curves would seem to indicate that the same economic forces had been at work on both sides of the Atlantic. In the subsequent advance, however, the curves have widely diverged. English prices rose suddenly in 1900, declining with equal suddenness in 1901; but, as Mr. Sauerbeck himself was careful to point out at the time, this was almost entirely due to the great temporary advance in coal and other material required for the Boer War. Both of the American tables indicate greater percentages of advance than the English; and Messrs. Dun's figures show an upward spring in 1902, not apparent in the Labor Bureau table, but the two curves come very close together again in 1904.

Table A may be summed up by the statement that, from the lowest American point in 1897, the Labor Bureau index-numbers show an advance from 89.7 to 113,—say of 26 per cent.,—while Messrs. Dun's numbers rise from 86 to 115.3,—say by 34 per cent.* On the other hand, Mr. Sauerbeck's English numbers advanced from 92.4 in 1896 to 106.1 in 1904, or by barely 15 per cent.

*As the report of the U.S. Mint Bureau for 1905 will not be published for some months to come, I have been unable to carry my statistical tables further than the end of 1904. For the sake of record, however, I may here add the following figures for last year's American prices. The Labor Bureau's general index-number for 1905 was 115.9, showing a rise of 29 per cent. since 1897. Messrs. Dun's total for July 1st, 1905, was $98.31, my comparative index-number for which would be 116.6, indicating an advance of nearly 36 per cent. during the same period.

It is desirable to subject the three systems under review to further analysis, but, owing to the construction of the tables, I have not been able to get beyond the two main categories of "Food" and "Other than Food," which are already clearly defined by Mr. Sauerbeck and Messrs. Dun.

Unfortunately, for my purpose, the Labor Bureau has included in "Farm Products" several articles which are not "Food," so that their two groups of "Farm Products" and "Food" cannot be amalgamated as they stand. I have accordingly had to rearrange their figures as follows:—

From the group of "Farm Products" I withdrew the figures for the four articles Raw Cotton, Flaxseed, Hay, and Hides, and transferred them to "Miscellaneous," thus modifying the index-numbers of the two groups. (See Appendix, Tables IV and V.) I then united the group of "Food" with the reduced group of "Farm Products," to obtain the figures for "Total Food." (See Appendix, Table VI.)

In order to make the much more complicated table of articles "Other than Food," I took, year by year, the index-number for each of the seven groups,—Clothes, etc., Fuel, etc., Metals, etc., Lumber, etc., Drugs, etc., House Furnishings, and Miscellaneous (as augmented by me), and multiplied it by the respective number of articles quoted for the year. The sum gave the total index-numbers, which, divided by the total number of articles, gave the new average index-number of "Other than Food" for the year in question. (See Appendix, Table VII.)

As the Labor Bureau's method has been strictly followed, the modified index-numbers for groups will be found to bring out the same total annual averages as appear in Table II. (See Appendix.)

Table C gives the comparative American and English index-numbers for "Total Food" for the years 1890–1904, in the same form as before, and Table D the respective statistical curves.

TABLE D.

COMPARISON OF AMERICAN AND ENGLISH INDEX-NUMBERS FOR "TOTAL FOOD."

For each curve **100** represents average of the years 1890–99.

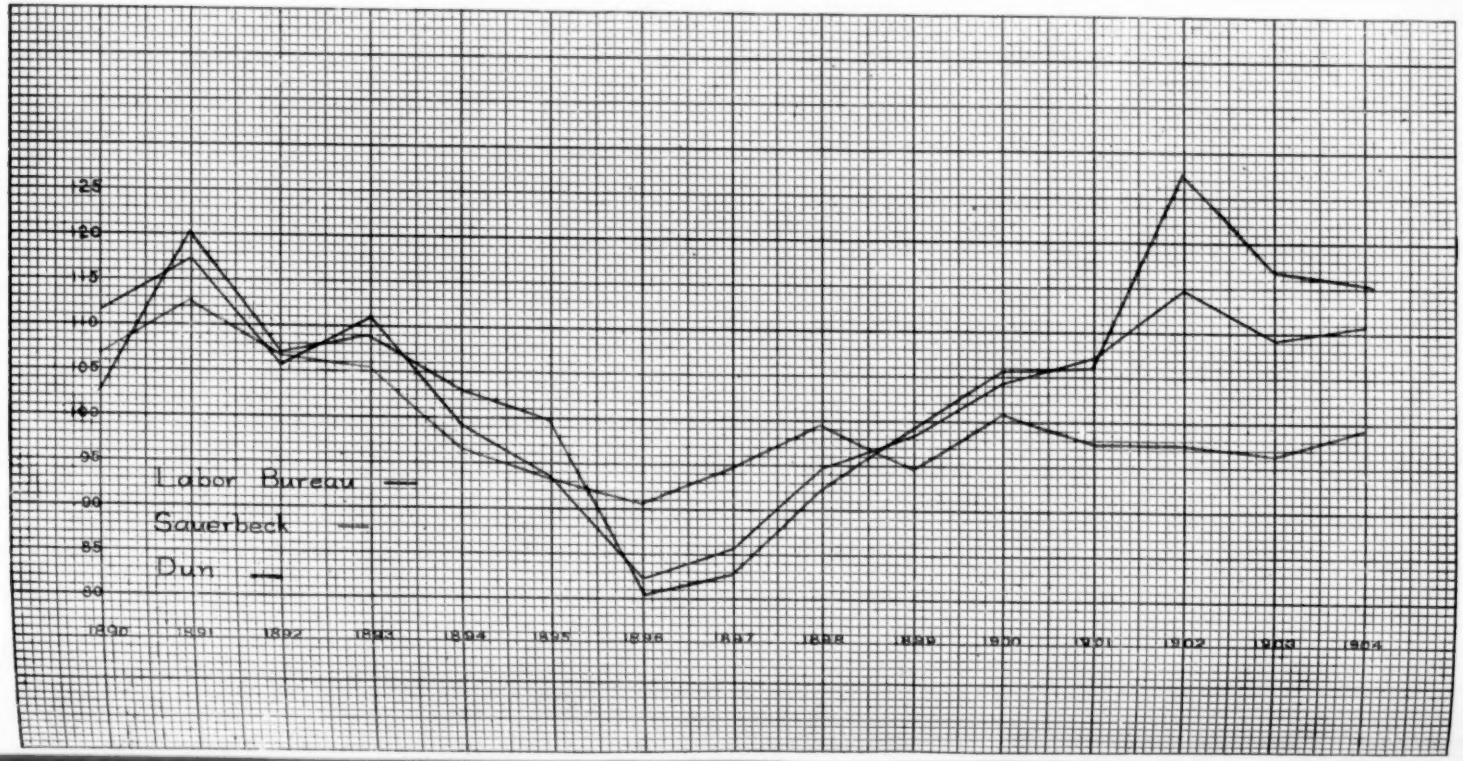


TABLE C.

COMPARISON OF AMERICAN AND ENGLISH INDEX-NUMBERS FOR "TOTAL FOOD" FOR THE YEARS 1890–1904.

Years.	American.			English.	
	Labor Bureau.	Dun's Prices for July 1.		Sauerbeck.	
	Original Percentages.	Original Numbers.	Comparative Index-Numbers.	Original Numbers.	Comparative Index-Numbers.
Average of 1890–99.	100	$41.98	100	68.5	100
1890	111.6	$43.37	103.3	73	106.6
1891	117.7	50.80	121	77	112.4
1892	105.9	45.26	107.8	73	106.6
1893	110.4	46.00	109.6	72	105.1
1894	99.1	43.38	103.3	66	96.4
1895	93.6	41.94	100	64	93.4
1896	82.1	33.96	80.9	62	90.5
1897	85.5	34.72	82.7	65	94.9
1898	94.8	38.74	92.3	68	99.3
1899	98.3	41.60	99.1	65	94.9
1900	104.1	44.19	105.3	69	100.7
1901	107.2	44.45	105.9	67	97.8
1902	114.9	53.47	127.4	67	97.8
1903	109.1	49.01	116.8	66	96.4
1904	110.9	48.33	115.1	68	99.3

Here the divergencies of the curves are very pronounced, although the general tendency is downward until 1896, and upward subsequently. Messrs. Dun's numbers are again both the lowest and the highest of all, as to which I shall have something to say later on. Since the lowest points in 1896, the advances have been as follows: the American rise, according to the Labor Bureau, has been from 82.1 to 110.9, or 35 per cent., and, according to Messrs. Dun, from 80.9 to 115.1, or 42 per cent.; while the English numbers range from 90.5 to 99.3, showing an advance of barely 10 per cent.

Finally, Tables E and F give the comparative index-numbers and curves for the years 1890–1904 for articles "Other than Food." The close correspondence of these

curves is remarkable, the only striking exception being the rapid upward English movement in 1899 and 1900, followed by an immediate decline in 1901 to near the American level. This, as has already been explained, was due entirely to the advance in war material during the South African hostilities.

TABLE E.

COMPARISON OF AMERICAN AND ENGLISH INDEX-NUMBERS FOR TOTAL "OTHER THAN FOOD" FOR THE YEARS 1890–1904.

Years.	American.			English.	
	Labor Bureau.	Dun's Prices for July 1.		Sauerbeck.	
	Original Percentages.	Original Numbers.	Comparative Index-Numbers.	Original Numbers.	Comparative Index-Numbers.
Average of 1890–99.	100	$42.30	100	63.9	100
1890	113.3	48.19	113.9	71	111.1
1891	109.7	45.30	107.1	68	106.4
1892	106.1	44.73	105.7	65	101.7
1893	103.9	44.62	105.5	65	101.7
1894	95	39.92	94.4	60	93.9
1895	93.6	39.57	93.5	60	93.9
1896	93.2	40.35	95.4	60	93.9
1897	90.5	37.74	89.2	59	92.3
1898	92.9	39.02	92.2	61	95.5
1899	102.8	43.63	103.1	70	109.5
1900	112.6	47.22	111.6	80	125.2
1901	108.9	47.06	111.2	72	112.7
1902	112.1	48.44	114.5	71	111.1
1903	115.2	50.45	119.3	72	112.7
1904	113.6	48.86	115.5	72	112.7

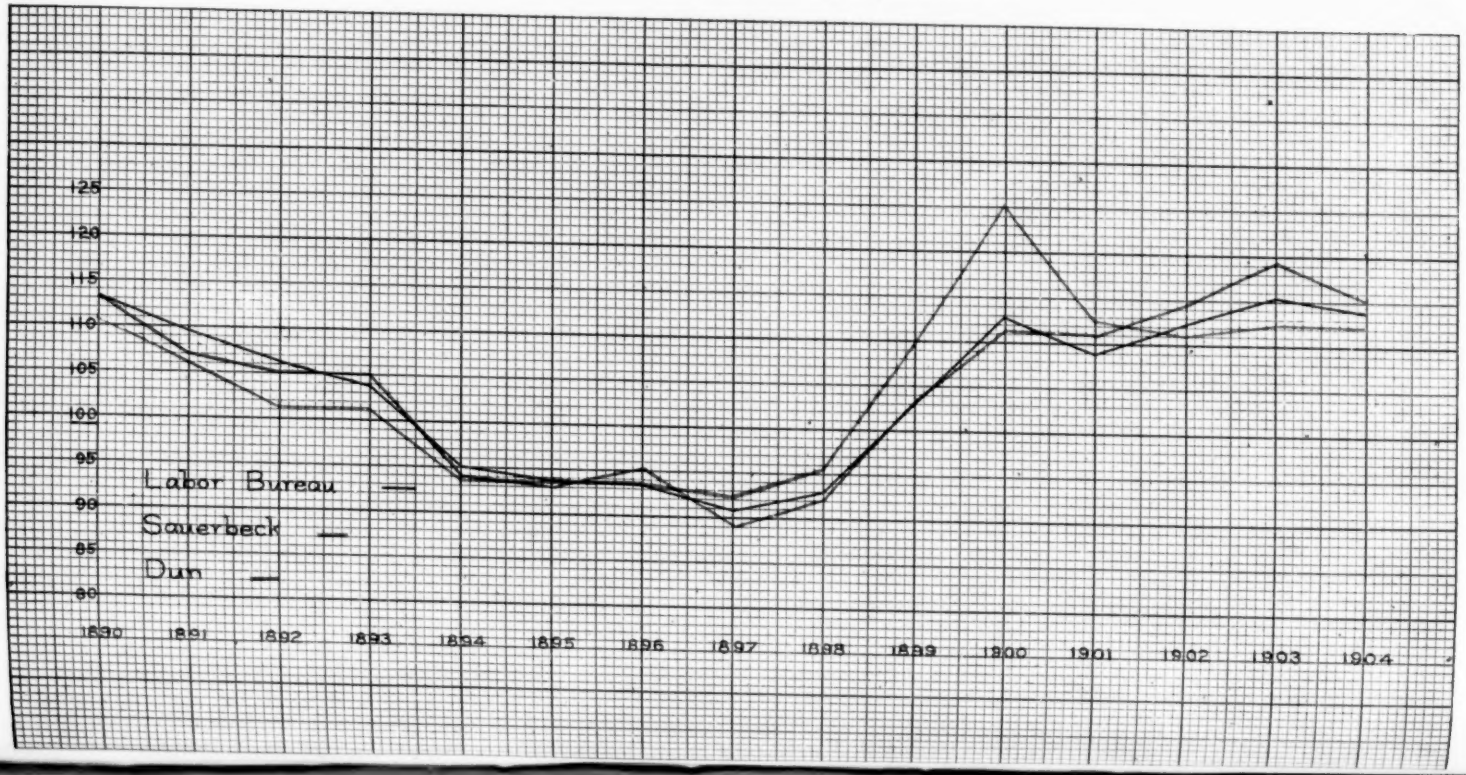
The lowest point of all three curves was in 1897, and the respective advances to 1904 were as follows: in American prices, according to the Labor Bureau, from 90.5 to 113.6, or nearly 26 per cent., or, according to Messrs. Dun, from 89.2 to 115.5, say 29 per cent.; and in English prices from 92.3 to 112.7, or 22 per cent.

The above noticeable discrepancies between our two sets of American tables seem to me explicable by the difference

TABLE F.

COMPARISON OF AMERICAN AND ENGLISH INDEX-NUMBERS FOR "OTHER THAN FOOD."

For each curve **100** represents average of years 1890–99.



in the relative importance given to "Food" articles by the respective authors. Such an explanation is borne out to some extent by the fact that our two American curves for articles "Other than Food" (see Table F) are almost coincident during the greater part of their course, and that their percentages of advance from 1897 to 1904 are as close together as can be expected, where the two systems of construction have so little resemblance. But this matter deserves further discussion.

On reference to Table I (see Appendix) it will be found that out of the sum of $84.28, which was Messrs. Dun's total average for the years 1890–99, an amount of $41.98, or nearly 50 per cent., was represented by "Food." As against this the Labor Bureau allots to "Food" (for the greater part of the period under review) not more than 65 out of 260 articles, or only 25 per cent. It may be noted, in this connection, that, out of Mr. Sauerbeck's total of 56 numbers, he appropriates 22 numbers, or 39 per cent., to "Food."

The effect of the great disparity between these two American methods of treating "Food" prices is, of course, reflected in the numbers representing the general upward movement since 1897, and is strikingly brought out by a comparison of the two records. The following statement is based upon our Tables C and E:—

COMPARISON OF PRICES IN 1904 WITH THOSE OF 1897.

	Labor Bureau.			Dun.		
	Total Index-Numbers.			Total Prices.		
	Food.	Other than Food.	Totals.	Food.	Other than Food.	Totals.
1904	7,208	22,045	29,253	$48.33	$48.86	$97.19
1897	5,641	17,657	23,298	34.72	37.74	72.46
Advance in Prices	1,567	4,388	5,955	$13.61	$11.12	$24.73
Percentages of total Advance	26	74	100	55	45	100

Another instance points in the same direction. The greatest fluctuations and the greatest continuous rise in any one group, as reported by Messrs. Dun (see Appendix, Table III), appear in "Breadstuffs," the figures for which were $10.50 in 1896 and $18.24 in 1904. This means an advance of 73 per cent. From the Labor Bureau's tables, after taking the 17 articles which comprise all that can possibly be referred to "Breadstuffs," I find that their total index-numbers amounted to 1,384 in 1896, and to 2,063 in 1904, indicating a rise of only 49 per cent. And a calculation, made as above, shows that the advance in "Breadstuffs" was 34 per cent. of the total, according to Messrs. Dun, while the Labor Bureau index-numbers make it barely 12 per cent.

It is evident that the authors of the Labor Bureau tables determined at the start that the best method of gauging the general movement of our prices was by quotations for manufactured products far more than by those for raw materials. The extent to which this preference has been carried is distinctly shown by a short table in their Bulletin for March, 1905 (page 416), where all the selected commodities are divided into two categories of "raw" and "manufactured," with the respective annual index-numbers from 1890 to 1904. And, comparing 1897, the lowest general point, with 1904, it appears that, while the advance in "raw" commodities was from 87.6 to 119.7, or nearly 37 per cent., that of "manufactured" commodities was from 90.1 to 111.3, or only 23 per cent.

But these two groups are of such unequal importance that, out of the 259 selected commodities, those classified as "raw" number only 50, the following list of which deserves attention. Raw Cotton, Raw Silk (2), Wool (2), Jute, Rubber, Flaxseed, Hay, Hides, Brimstone, Crude Petroleum, Coal (7), Copper Ingots, Pig-iron (4), Pig-lead, Spelter, Pig-tin, and Bar Silver give a total of 28 numbers, the remaining 22 being "Food" products. Now we have already seen that the Labor Bureau's "Food" quotations are only 65 or 66 in all,

so that, even in this category, 43 or 44—say two-thirds—are for "manufactured" articles.

Referring once more to the Labor Bureau's Bulletin for March, 1905 (page 409), their own method of "weighting" commodities is explained to be "simply to use a large number of representative staple articles, selecting them in such a manner as to make them to a large extent weight themselves." They add the following example in support of their system. "Upon a casual examination it may seem that, by this method, a comparatively unimportant commodity—such, for instance, as cotton-seed meal—has been given the same weight or importance as one of the more important commodities, such as wheat. A closer examination, however, shows that cotton-seed meal enters into no other commodity under consideration, while wheat is not only quoted as the raw material, but enters into the two descriptions of wheat-flour, the two descriptions of crackers, and the three descriptions of loaf-bread."

With all due respect to the Labor Bureau, I venture to doubt whether, as factors in determining the general level of 259 commodity prices, the relative importance of "Wheat" and "Cotton-seed Meal" can be fairly taken as only 8 to 1. And I may further doubt whether "Corn," which is represented by one quotation for the grain and by two for meal, is not, for any general movement of prices, far more than three times as important as, for instance, "Putty" or "Common Glass Tumblers," each of which has one index-number.

The same kind of criticism might be extended to demonstrate what I believe to be the inadequate share given to "Food" in the general scheme of the Labor Bureau's price tables. It should not be forgotten that our "Food" products not only suffice for our own domestic consumption, but afford a great surplus for export. Speaking broadly, their prices are independent of tariffs, and most of the labor employed is not of the highly specialized character required in more complicated industries.

Moreover, four-fifths of the Labor Bureau's quotations are for "manufactured" articles, into the first cost of which the wages of skilled labor usually enter in large proportions. In last analysis, therefore, it would seem that some addition is needed to this list of commodities to account, however roughly, for the component part of "Food" in the real wages received by that vast army of workmen. Putting this idea into more concrete form, I suggest that the Labor Bureau's statistics might be a more accurate record of the actual changes in our general price level, if the staple raw materials of food were more heavily weighted.

The considerations above mentioned convince me that, while the share of "Food" in Messrs. Dun's tables may be somewhat exaggerated, it has not been given sufficient importance by the Labor Bureau. The advance, at the close of 1904, in our general level of prices since 1897 is likely to have been somewhat less than Messrs. Dun's figures of 34 per cent., but greater than the 26 per cent. of the Labor Bureau. I am disposed to suggest, as a safe estimate, an average rise of 30 per cent.

For English prices we have seen that Mr. Sauerbeck's index-numbers show an advance of about 15 per cent. since 1896.

Turning now to the total output of gold during the ten years 1895–1904, we find by the United States Mint Reports that it amounted, in round figures, to $2,716 millions (Table G), the disposition of which can be fairly approximated.

TABLE G.

WORLD'S PRODUCTION OF GOLD.

Compiled from United States Mint Reports.

Years.	*Millions.*
1895	$199
1896	202
1897	236
1898	287
1899	307
1900	254
1901	261
1902	297
1903	326
1904	347
Total for 10 years, 1895–1904	$2,716

The use of gold in industry and the arts has shown a steady increase from nearly $59 millions in 1895 to $80 millions in 1904, and the total absorption of the metal for these purposes is estimated by the United States Mint Bureau at nearly $701 millions during the ten years under review (Table H).

TABLE H.

WORLD'S INDUSTRIAL CONSUMPTION OF GOLD.

Compiled from United States Mint Reports.

Years.	*Millions.*
1895	$59
1896	59
1897	59
1898	65
1899	73
1900	75
1901	79
1902	76
1903	76
1904	80
Total for 10 years, 1895–1904	$701

The annual loss of gold by abrasion of coins, by shipwreck and other casualties, must also be taken into account. About ten years ago I was informed by M. de Foville (then Director of the French Mint) that he considered $8 millions a year to be a low estimate of such losses at that time. In view of the much greater mass of material with which we have to deal since then, it seems safe to bring M. de Foville's figures up to $8½ millions a year, making $85 millions for our period.

Thus, deducting from the total output of $2,716 millions the $701 millions used in industry and the arts, and $85 millions for loss by abrasion and casualties, we have had a value of $1,930 millions available for additions to the world's stock of gold money. Within about one and a half per cent. the whole of this enormous sum can be accounted for as follows:—

TABLE J.

INCREASE OF WORLD'S STOCK OF GOLD MONEY BETWEEN JANUARY 1, 1895, AND DECEMBER 31, 1904.

Compiled from United States Mint Reports.

Countries.	Millions.		
	Stock. Jan. 1, 1895.	Stock. Dec. 31, 1904.	Increase in 10 Years.
United States	$618	$1,348	$730
Canada	14	52	38
Cuba	18	20	2
Mexico	5	9	4
Hayti	3	1	*—2
South American States	40	106	66
Central American States	1	2	1
Total North and South America	$699	$1,538	$839 net
Austria-Hungary	$140	$305	$165
Belgium	55	30	*—25
Great Britain and Ireland	580	533	*—47
France	850	926	76
Germany	625	887	262
Italy	98	131	33
Russia	480	784	304
Spain	40	72	32
Turkey	50	50	—
Other Countries in Europe	155	141	*—14
Total, Europe	$3,073	$3,859	$786 net
Australasia	$115	$129	$14
Egypt	120	87	*—33
Japan	80	53	*—27
India	—	264	264
Siam	—	1	1
South Africa	—	56	56
China	—	—	—
Total Asia, Africa, and Australasia	$315	$590	$275 net
SUMMARY.			
North and South America	$699	$1,538	$839
Europe	3,073	3,859	786
Asia, Africa, and Australasia	315	590	275
Aggregate	$4,087	$5,987	$1,900

* These figures show a *decrease.*

According to the United States Mint Reports, the world's stock of gold money amounted to $4,087 millions on January 1, 1895, and to $5,987 millions on December 31, 1904, showing an increase during ten years of $1,900 millions. Details will be found in Table J, the figures of which, though confessedly incomplete, are the best estimates that can be given by the Mint Bureau, after every attempt has been made to get official information.

It will be seen that some $730 millions have been acquired by the United States (that is, rather more than the total output of our own mines), and $109 millions by other countries in North and South America. Europe has taken $786 millions, while Asia, Africa, and Australasia have absorbed $275 millions, most of which has gone into India. This leaves only $30 millions unaccounted for out of the total of $1,930 millions available for gold money.

Turn for a moment to the years immediately preceding the period with which we are dealing.

In the *Économiste Européen* of Paris, the editor published on April 25, 1896, a letter from me wherein I discussed the distribution of the world's output of gold during the four years 1892–95, beginning from the time when the then newly discovered supplies were making a decided increase in the annual figures. I showed, by the weekly statistics of the paper itself, that the European banks of issue and the Russian government war-chest had absorbed not only the whole production of the four years available for money, but $100 millions in addition. Moreover, as against an increase of some $513 millions in gold held by the European banks, their note issues had augmented during the same time by only some 325 millions.

I concluded by contrasting the decline in prices during those four years, in face of the new gold supplies, and the stimulus to commerce and enterprise given by the much smaller amount produced in California and Australia during the four years 1851–55.

"During the years 1851–55 [I translate from the French of my original letter] the world's annual production of gold averaged $139 millions. Sauerbeck's index-number for the year 1850 was 77, while that for 1855 was 101, showing that, during the period, the new gold had at once given a great impulse to the general movement of human industry and enterprise, with a continuous rise in prices amounting to 31 per cent. During the last four years, on the contrary, with an unheard of production of gold, averaging $171 millions per year, the general level of gold prices for commodities fell by at least 14 per cent. Sauerbeck's index-number for 1891 was 72, and that for 1895 was 62, while for the month of March last it had further fallen to 60.7. I have confined myself to a statement of facts without raising any discussion of principles. All the same these figures give food for reflection!"

It was clear from the figures of 1892–95 that the new output of South Africa and Alaska, so far from causing any advance in prices, had not even been able to arrest the decline of values measured in gold, which had gone on steadily since 1874. Not only this, but Sauerbeck's tables, during the ten years since my letter was written, indicate a remarkable sluggishness in any upward movement of prices, which forces us to inquire why the stimulus from a flood of gold such as the world has never seen before should be so insignificant in Europe, while it has been so well marked in the United States.

In comparing the movements of prices in different countries, allowance must be made for the influence, in each case, of the greater or less amount of protection afforded by local customs tariffs. In Great Britain this consideration may be practically disregarded, while in the United States protection is raised to a high power, made still higher by strong combinations in restraint of competition.

Again, the tendency of a given increase in the stock of gold money to develop industry and advance prices receives

additional force from the banking facilities and credit instruments used by the country in question. The coefficient for such increase would certainly be greater to-day for the United States and England than for any other nations.

But, with these reservations, I believe an explanation of the difference in phenomena between the United States and Europe may be found in monetary history.

In the middle of the nineteenth century the general level of prices throughout the world depended upon the total existing stocks of both gold and silver money. Some countries were under the single gold standard, others under the single silver standard, and some under a bimetallic régime of the two, linked together at a legal ratio. Moreover, this ratio, by natural evolution, by commercial usage, and by concurrent legal enactments in a powerful group of countries, had become approximately the same all the world over. The consequence was that such a par of exchange had become established between silver and gold that commercial dealings between nations encountered no obstacle from a difference in their respective standards of value.

There exist tolerably accurate records of the total production of the precious metals from the date of the discovery of America in 1492. From these it appears that, down to 1850, the aggregate production had amounted, in round figures, to $4\frac{3}{4}$ million kilograms of gold and to 150 million kilograms of silver.

But during the ten years following 1850 the new discoveries in California and Australia brought the total production of gold up to some $2\frac{1}{4}$ million kilograms,—more than the whole output during the previous 110 years, and equal to nearly half of the aggregate product during the 358 years from 1492 to 1850.

We must bear in mind the fact above mentioned, that there was then a recognized approximate par of exchange between the two precious metals, if we wish to appreciate what

was bound to happen, and what did actually happen, at this juncture. The new gold promptly found its way into the United States and the great commercial countries of Europe, where it at once began to push out much of the silver, which had hitherto been the mainstay of the circulation. This silver, easily and without sensible loss to any one, was transferred to India, China, and other markets where this metal was the sole standard of value, and so the stimulus of the mass of newly discovered gold was made to extend all over the earth. Commerce and industry were developed on a scale hitherto unknown, and commodities responded by a rise in the general level of prices. I doubt if any one who has studied the subject can hesitate to admit that this almost instantaneous effect of the new gold of 1851 upon trade and prices was possible only because the commercial world had practically to take no thought of whether local standards of value were gold or silver or both.

We shall see the reverse of the shield during the years 1895–1904. A further short sketch of monetary history is needed to bring us down to the present time.

In 1873 the new German Empire adopted the gold standard and demonetized silver. Within a short time France and the rest of the Latin Union closed their mints to the free coinage of silver, as a matter of self-defence against the action of Germany. These measures dislocated, once and for all, the par of exchange between countries on a gold standard and those on a silver standard, trade between which became increasingly difficult, if not hazardous. For the immediate effect of this outlawry of silver was to throw the whole burden of supporting prices, throughout the greater commercial nations, on gold alone instead of on both gold and silver, and this during years when the product of gold was annually diminishing. On the other hand, the silver output showed a rapid increase, which was most disquieting, as one mint after another became closed to its free coinage, in the haste of the almost panic-stricken nations

to get under cover of the gold standard, and to scramble for the yellow metal.

Since the vastly increased area of gold standard countries possessed an inadequate stock of this metal, as a base for commodity values, with the prospect of insufficient annual additions, their general level of prices became lower and lower. The gold price of silver also declined, but silver countries absorbed large quantities of their standard metal at constantly cheaper rates, measured in gold, and paid for it by new exports to gold countries of wheat and other commodities. Such exports would have been impossible at the old par of exchange, but they then became profitable under the changed relative values of the two precious metals.

The interaction of the diminishing supply of gold in gold standard countries and of the growing abundance of silver in silver standard countries was very subtle, but it was clear enough in the long run. Prices in silver standard countries remained practically steady, while prices in gold standard countries kept on declining to a point where the new competition from silver-priced exports died out because it was no longer profitable.

During the critical years which we have been discussing, a potent factor in determining the relative values of gold and silver was the payment in England of the "Home charges" of the Indian government, amounting in gold to some £16,000,000 to £17,000,000 per year. These payments were made by weekly sales in London of "Council Bills" on the Indian Treasury, which were at that time, as far as their purchasers were concerned, the equivalent of silver remittances to India.

As the Indian government could meet its gold obligations only by these regular sales, it was evident that no one would buy silver for remittance to India unless at a lower price than the more convenient Council Bills.

It was equally evident that the gold prices of these bills

must be constantly forced down, because they came into direct competition with bar silver.

In other words, the ordinary financial necessities of the Indian government made it practically the largest seller of silver in the world, and the certificates for this silver had to be sold week after week at steadily declining rates.

In this way the sale of Council Bills determined the current London prices of bar silver, although the fact was, by no means, generally recognized at the time.

These conditions, however, were abruptly brought to an end in 1893, when the Indian mints were closed to the free coinage of silver, the rupee being legally fixed at a gold value of 16 pence (or 15 rupees to a pound sterling). The coinage of silver rupees was restricted, and remained entirely under government control.

This measure was enacted in a year which witnessed a total silver output of over five million kilograms, the greatest recorded up to that time. On the other hand, the gold product had increased from 144,000 kilograms in 1883 (its lowest figure since the California discoveries) to only 221,000 kilograms.

Ever since 1893, however, it has happened that the world's supply of gold has been increasing by leaps and bounds, while the percentages of growth in the yield of silver have been very small in comparison.

Russia and Japan had adopted the gold standard in 1897, since when the British Straits Settlements, French Indo-China, the Philippines, and Mexico have all been put on a nominal gold basis, with controlled silver circulations. China is, therefore, the only great country of the world left with a silver standard of value, and the conditions of her currency are too chaotic for discussion here.

The legislative enactments which I have just sketched amount to an unprecedented revolution during the last thirty years, by which gold has been almost universally adopted, and silver discarded, as the standard of value.

In the throes of such a revolution it is clear that all the gold in sight had to be at once collected by government treasuries and banks of issue, as a buttress for their finance and existing circulation, and we have seen that for a long time the supplies were hopelessly inadequate even for this purpose.

Things had shaken down to some extent when the mines of South Africa and Alaska began to furnish a most bountiful new supply of gold. The first duty, however, of most of this was to complete the specie basis which a number of countries had resolutely determined to accumulate for their circulation.

To take only the more important instances, Russia, Austria, Hungary, Italy, and some South American States, which had been practically under régimes of inconvertible paper money, have all painfully gathered in gold reserves. The effect of this process has been altogether beneficent, since a substantial backing has been given to local ranges of prices which had previously been more or less fictitious.

It will be seen from Table J that the countries in question during the years 1895–1904 absorbed $568 millions of gold, or nearly one-third of the total amount mined during the period, which was available for money. It was hardly to be expected that the influence of this new gold should extend, beyond its first indispensable functions, to any general enhancement of prices.

In the economic history of the United States, on the other hand, we are confronted with an entirely different set of conditions.

In the first place, the situation here was undoubtedly complicated for many years through our successive attempts to rehabilitate silver, by ourselves alone if Europe would not help us, and by the unwise additions of an enormous amount of silver to our monetary system. The inevitable result was general disorganization in our commerce and industry, which were also checked by a feeling of deep distrust as to

the future of our standard of value. But during these "lean years" our people were forced to learn much-needed lessons of prudence and economy, and to put their house in order by degrees, until, by the defeat of Mr. Bryan in the Presidential election of 1896, they showed their final determination to give up "monkeying with the buzz-saw" of silver.

This unmistakable adherence of our people to the gold standard of value made the years 1896–97 the turning point of our commercial and industrial development, as well as the end of our long period of declining prices. For the economic position of the nation was sound enough at the base, and the reorganization of enterprise went on rapidly as soon as the main cause of distrust was removed.

Accordingly, the new gold which the results of our trade kept pouring into our Treasury and banks, at the average rate (as we have seen) of some $73 million annually, has been able to exercise its full power as a support for advancing prices during the greater part of the last decade. There were no old gaps to be filled up first, as we found to be the case in some countries, nor were there, as in Europe, any great war-chests to swallow up unknown millions of the new gold, as effectually, for all peaceful purposes, as if it had been put back into the mines.

To conclude. We have seen that, as far as Mr. Sauerbeck's index-numbers may be taken as a rough measure of European prices, the general advance from the lowest point has been only 15 per cent., as against double that figure in the United States. I have attempted to explain this by the special channels through which the new gold had to flow in Europe, as compared with its more perfect utilization by ourselves. It remains to be seen whether there is to be a continuance of the process of acquiring gold as an adequate mainstay for existing prices, by several important countries which have recently passed from inconverti-

ble paper money to the gold standard. In the mean time, speaking broadly, the new gold has certainly contributed its fair share to their greater financial security and prosperity as it has done to ours, and without it the level of prices could nowhere be what it is to-day.

On the other hand, it must be remembered that the horizon of the world of commerce and industry is now infinitely wider than that of the last generation, and each ounce of gold has to serve as a basis for more transactions than before. Even, therefore, with a constant growth in the output of that metal, the new conditions under which commodities are produced seem to preclude anything like a return to the price-levels of thirty-five years ago.

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APPENDIX.

TABLE I.

SUMMARY OF SAUERBECK'S INDEX-NUMBERS FOR THE YEARS 1890–1904.

Years.	Food.				Materials.				Grand Total.
	Vegetable Food.	Animal Food.	Sugar, Coffee, Tea.	Total Food.	Minerals.	Textiles.	Sundries.	Total Materials.	
1890 . . .	65	82	70	73	80	66	69	71	72
1891 . . .	75	81	71	77	76	59	69	68	72
1892 . . .	65	84	69	73	71	57	67	65	68
1893 . . .	59	85	75	72	68	59	68	65	68
1894 . . .	55	80	65	66	64	53	64	60	63
1895 . . .	54	78	62	64	62	52	65	60	62
1896 . . .	53	73	59	62	63	54	63	60	61
1897 . . .	60	79	52	65	66	51	62	59	62
1898 . . .	67	77	51	68	70	51	63	61	64
1899 . . .	60	79	53	65	92	58	65	70	68
Average of 1890–99.	**61.3**	**79.8**	**62.7**	**68.5**	**71.2**	**56.0**	**65.5**	**63.9**	**66.0**
1900 . . .	62	85	54	69	108	66	71	80	75
1901 . . .	62	85	46	67	89	60	71	72	70
1902 . . .	63	87	41	67	82	61	71	71	69
1903 . . .	62	84	44	66	82	66	69	72	69
1904 . . .	63	83	50	68	81	71	67	72	70

APPENDIX. TABLE II.

LABOR BUREAU'S SUMMARY OF RELATIVE PRICES OF COMMODITIES FOR THE YEARS 1900–04.

Years.	Farm Products.	Food, etc.	Cloths and Clothing.	Fuel and Lighting.	Metals and Implements.	Lumber and Building Materials.	Drugs and Chemicals.	House Furnishing Goods.	Miscellaneous.	All Commodities.
1890 . .	110.0	112.4	113.5	104.7	119.2	111.8	110.2	111.1	110.3	112.9
1891 . .	121.5	115.7	111.3	102.7	111.7	108.4	103.6	110.2	109.4	111.7
1892 . .	111.7	103.6	109.0	101.1	106.0	102.8	102.9	106.5	106.2	106.1
1893 . .	107.9	110.2	107.2	100.0	100.7	101.9	100.5	104.9	105.9	105.6
1894 . .	95.9	99.8	96.1	92.4	90.7	96.3	89.8	100.1	99.8	96.1
1895 . .	93.3	94.6	92.7	98.1	92.0	94.1	87.9	96.5	94.5	93.6
1896 . .	78.3	83.8	91.3	104.3	93.7	93.4	92.6	94.0	91.4	90.4
1897 . .	85.2	87.7	91.1	96.4	86.6	90.4	94.4	89.8	92.1	89.7
1898 . .	96.1	94.4	93.4	95.4	86.4	95.8	106.6	92.0	92.4	93.4
1899 . .	100.0	98.3	96.7	105.0	114.7	105.8	111.3	95.1	97.7	101.7
1900 . .	109.5	104.2	106.8	120.9	120.5	115.7	115.7	106.1	109.8	110.5
1901 . .	116.9	105.9	101.0	119.5	111.9	116.7	115.2	110.9	107.4	108.5
1902 . .	130.5	111.3	102.0	134.3	117.2	118.8	114.2	112.2	114.1	112.9
1903 . .	118.8	107.1	106.6	149.3	117.6	121.4	112.6	113.0	113.6	113.6
1904 . .	126.2	107.2	109.8	132.6	109.6	122.7	110.0	111.7	111.7	113.0

APPENDIX. TABLE III.

MESSRS. DUN'S INDEX-NUMBERS ON JULY 1 OF EACH YEAR FROM 1890 TO 1904.

Years.	Food.					Other than Food.				Grand Total for each July 1.
	Breadstuffs.	Meats.	Dairy and Garden.	Other Food.	Total Food.	Clothing.	Metals.	Miscellaneous.	Total, Other than Food.	
1890	$14.87	$8.04	$10.71	$9.75	$43.37	$17.26	$15.51	$15.42	$48.19	$91.56
1891	19.78	9.22	12.46	9.34	50.80	16.50	15.11	13.69	45.30	96.10
1892	17.43	8.70	10.40	8.73	45.26	15.65	14.83	14.25	44.73	89.99
1893	14.96	10.14	11.71	9.19	46.00	15.87	14.03	14.72	44.62	90.62
1894	15.12	9.39	10.39	8.48	43.38	13.86	12.02	14.04	39.92	83.30
1895	14.76	8.62	9.87	8.69	41.94	15.32	11.02	13.23	39.57	81.51
1896	10.50	7.06	7.87	8.53	33.96	13.60	13.23	13.52	40.35	74.31
1897	10.59	7.53	8.71	7.89	34.72	13.81	11.64	12.29	37.74	72.46
1898	12.78	7.69	9.44	8.83	38.74	14.66	11.84	12.52	39.02	77.76
1899	13.48	7.99	10.97	9.16	41.60	15.02	15.64	12.97	43.63	85.23
Average of 1890–99	$14.43	$8.44	$10.25	$8.86	$41.98	$15.15	$13.49	$13.66	$42.30	$84.28
1900	$14.90	$8.91	$10.90	$9.48	$44.19	$16.32	$14.83	$16.07	$47.22	$91.41
1901	14.90	9.43	11.03	9.09	44.45	15.10	15.34	16.62	47.06	91.51
1902	20.53	11.63	12.56	8.75	53.47	15.53	16.08	16.83	48.44	101.91
1903	17.47	9.27	13.08	9.19	49.01	17.14	16.54	16.77	50.45	99.46
1904	18.24	9.03	10.65	10.41	48.33	16.51	15.43	16.92	48.86	97.19

APPENDIX. TABLE IV.

LABOR BUREAU'S INDEX-NUMBERS, 1890-1904.

GROUP OF "FARM PRODUCTS" AS REDUCED BY TRANSFER OF 4 ARTICLES TO "MISCELLANEOUS."

Articles transferred to "Miscellaneous."	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.
Raw Cotton	142.9	110.8	99.0	107.2	90.2	94.0	102.0	92.2	76.9	84.7	123.8	111.1	115.1	144.7	155.9
Flaxseed	125.5	97.1	91.4	97.7	121.6	111.8	72.9	78.1	99.8	104.0	145.7	145.8	135.0	94.1	99.6
Hay	95.8	117.8	113.5	107.4	99.9	109.1	99.0	80.9	79.9	96.6	110.9	123.0	120.9	119.2	112.5
Hides	99.6	101.5	92.8	79.9	68.4	109.7	86.6	106.3	122.8	131.8	127.4	132.0	142.8	124.8	124.4
Total of 4 Articles transferred to "Miscellaneous"	463.8	427.2	396.7	392.2	380.1	424.6	360.5	357.5	379.4	417.1	507.8	511.9	513.8	482.8	492.4
Totals of "Farm Products" as originally published. 16 Articles	1760.5	1943.9	1786.9	1726.4	1534.7	1493.2	1253.0	1262.7	1538.1	1599.3	1751.5	1870.2	2088.3	1901.5	2018.7
New totals of "Farm Products" as reduced. 12 Articles	1296.7	1516.7	1390.2	1334.2	1154.6	1068.6	892.5	905.2	1158.7	1182.2	1243.7	1358.3	1574.5	1418.7	1526.3

APPENDIX. TABLE V.

LABOR BUREAU'S INDEX-NUMBERS, 1890–1904.

GROUP OF "MISCELLANEOUS" AS AUGMENTED BY TRANSFER OF 4 ARTICLES FROM "FARM PRODUCTS."

	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.
Average Index-Numbers for "Miscellaneous" as published	110.3	109.4	106.2	105.9	99.8	94.5	91.4	92.1	92.4	97.7	109.8	107.4	114.1	113.6	111.7
Multiplied by 13 for Totals .	1433.9	1422.2	1380.6	1376.7	1297.4	1228.5	1188.2	1197.3	1201.2	1270.1	1427.4	1396.2	1483.3	1476.8	1452.1
Add Totals taken from "Farm Products," 4 Articles	463.8	427.2	396.7	392.2	380.1	424.6	360.5	357.5	379.4	417.1	507.8	511.9	513.8	482.8	492.4
Aggregate for 17 Articles .	1897.7	1849.4	1777.3	1768.9	1677.5	1653.1	1548.7	1554.8	1580.6	1687.2	1935.2	1908.1	1997.1	1959.6	1944.5
Divided by 17 for New Average Numbers of "Miscellaneous" . . .	111.6	108.8	104.5	104.1	98.7	97.2	91.1	91.5	93.0	99.2	113.8	112.2	117.5	115.3	114.4

APPENDIX. TABLE VI.

LABOR BUREAU'S INDEX-NUMBERS, 1890–1904.

CONSTRUCTION OF TABLE OF NEW INDEX-NUMBERS FOR "TOTAL FOOD."

	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.
Average Index-Numbers for "Food" as published	112.4	115.7	103.6	110.2	99.8	94.6	83.8	87.7	94.4	98.3	104.2	105.9	111.3	107.1	107.2
Multiplied by Stated Number of Articles for each	× 53	× 53	× 53	× 54	× 54	× 54	× 54	× 54	× 54	× 54	× 54	× 54	× 54	× 54	× 53
Year for Totals	5957.2	6132.1	5490.8	5950.8	5389.2	5108.4	4525.2	4735.8	5097.6	5308.2	5626.8	5718.6	6010.2	5783.4	5681.6
Add New Totals of "Farm Products." See Table IV.	1296.7	1516.7	1390.2	1334.2	1154.6	1068.6	892.5	905.2	1158.7	1182.2	1243.7	1358.3	1574.5	1418.7	1526.3
Aggregate Index-Numbers for Total Food	7253.9	7648.8	6881.0	7285.0	6543.8	6177.0	5417.7	5641.0	6256.3	6490.4	6870.5	7076.9	7854.7	7202.1	7207.9
Divided by 65 Articles for 1890–91–92, 1904, by 66 for Remainder, gives *New Index-Numbers for "Total Food"*	111.6	117.7	105.9	110.4	99.1	93.6	82.1	85.5	94.8	98.3	104.1	107.2	114.9	109.1	110.9

APPENDIX. TABLE VII.

LABOR BUREAU'S INDEX-NUMBERS, 1890–1904.

CONSTRUCTION OF TABLE OF NEW INDEX-NUMBERS FOR TOTAL "OTHER THAN FOOD."

Years.		Cloths and Clothing.	Fuel and Lighting.	Metals and Implements.	Lumber and Building Materials.	Drugs and Chemicals.	House Furnishings.	Miscellaneous (as augmented.) See Table V.	Aggregate.	New Average Index-No. for "Other than Food."
1890	Labor Bureau's Average Index-Number	113.5	104.7	119.2	111.8	110.2	111.1	111.6	—	
	Number of Articles	70	13	37	26	9	14	17	186	
	Totals	7945.0	1361.1	4410.4	2906.8	991.8	1555.4	1897.7	21,068.2	113.3
1891	Labor Bureau's Average Index-Number	111.3	102.7	111.7	108.4	103.6	110.2	108.8	—	
	Number of Articles	70	13	37	26	9	14	17	186	
	Totals	7791.0	1335.1	4132.9	2818.4	932.4	1542.8	1849.4	20,402.0	109.7
1892	Labor Bureau's Average Index-Number	109.0	101.1	106.0	102.8	102.9	106.5	104.5	—	
	Number of Articles	72	13	37	26	9	14	17	188	
	Totals	7848.0	1314.3	3922.0	2672.8	926.1	1491.0	1777.3	19,951.5	106.1
1893	Labor Bureau's Average Index-Number	107.2	100.0	100.7	101.9	100.5	104.9	104.1	—	
	Number of Articles	73	13	37	26	9	14	17	189	
	Total	7825.6	1300.0	3725.9	2649.4	904.5	1468.6	1768.9	19,642.9	103.9
1894	Labor Bureau's Average Index-Number	96.1	92.4	90.7	96.3	89.8	100.1	98.7	—	
	Number of Articles	73	13	38	26	9	14	17	190	
	Total	7015.3	1201.2	3446.6	2503.8	808.2	1401.4	1677.5	18,054.0	95.0
1895	Labor Bureau's Average Index-Number	92.7	98.1	92.0	94.1	87.9	96.5	97.2	—	
	Number of Articles	75	13	38	27	9	14	17	193	
	Total	6952.5	1275.3	3496.0	2540.7	791.1	1351.0	1653.1	18,059.7	93.6

	Labor Bureau's Average Index-Number	91.3	104.3	93.7	93.4	92.6	94.0	91.1	—	
	Number of Articles	75	13	39	27	9	14	17	194	

1896	Labor Bureau's Average Index-Number	91.3	104.3	93.7	93.4	92.6	94.0	91.1	—	
	Number of Articles	75	13	39	27	9	14	17	194	
	Total	6847.5	1355.9	3654.3	2521.8	833.4	1316.0	1548.7	18,077.6	93.2
1897	Labor Bureau's Average Index-Number	91.1	96.4	86.6	90.4	94.4	89.8	91.5	—	
	Number of Articles	76	13	39	27	9	14	17	195	
	Total	6923.6	1253.2	3377.4	2440.8	849.6	1257.2	1554.8	17,656.6	90.5
1898	Labor Bureau's Average Index-Number	93.4	95.4	86.4	95.8	106.6	92.0	93.0	—	
	Number of Articles	76	13	39	27	9	17	17	195	
	Total	7098.4	1240.2	3369.6	2586.8	959.4	1288.0	1580.6	17,122.8	92.9
1899	Labor Bureau's Average Index-Number	96.7	105.0	114.7	105.6	111.3	95.1	99.2	—	
	Number of Articles	76	13	38	27	9	14	17	194	
	Total	7349.2	1365.0	4358.6	2856.6	1001.7	1331.4	1687.2	19,949.7	102.8
1900	Labor Bureau's Average Index-Number	106.8	120.9	120.5	115.7	115.7	106.1	113.8	—	
	Number of Articles	76	13	38	27	9	14	14	194	
	Total	8116.8	1571.7	4579.0	3123.9	1041.3	1485.4	1935.2	21,853.3	112.6
1901	Labor Bureau's Average Index-Number	101.0	119.5	111.9	116.7	115.2	110.9	112.2	—	
	Number of Articles	76	13	38	27	9	14	17	194	
	Total	7676.0	1553.5	4252.2	3150.9	1036.8	1552.6	1908.1	21,130.1	108.9
1902	Labor Bureau's Average Index-Number	102.0	134.3	117.2	118.8	114.2	112.2	117.5	—	
	Number of Articles	76	13	38	27	9	14	17	194	
	Total	7752.0	1745.9	4453.6	3207.6	1027.8	1570.8	1997.1	21,754.8	112.1
1903	Labor Bureau's Average Index-Number	106.6	149.3	117.6	121.4	112.6	113.0	115.3	—	
	Number of Articles	76	13	38	27	9	14	17	194	
	Total	8101.6	1940.9	4468.8	3277.8	1013.4	1582.0	1959.6	22,344.1	115.2
1904	Labor Bureau's Average Index-Number	109.8	132.6	109.6	122.7	110.0	111.7	114.4	—	
	Number of Articles	76	13	38	27	9	14	17	194	
	Total	8344.8	1723.8	4164.8	3312.9	990.0	1563.8	1944.5	22,044.6	113.6

A NEW METHOD OF INDEX-NUMBERS FOR AMERICAN COMMODITY-PRICES.

By Francis B. Forbes.

While the foregoing article on Gold and Prices was passing through the press, it occurred to me to make an actual test of my suggestions as to the proper weighting of "Food" in determining the general level of American prices. And, as I had expressed the opinion that Messrs. Dun's apportionment to "Food" of 50 per cent. of their total was too high, while the Labor Bureau's 25 per cent. of theirs was too low, I decided to attempt an adaptation of Mr. Sauerbeck's English tables to our purposes. As he allots to "Food" 22 out of a total of 56 articles, his method of weighting comes nearly midway between the other two. From another point of view, the fact that his figures have now been continuously published for twenty years seems to indicate that his system must have enduring merits.

Now my recent study of the Labor Bureau's tables convinces me that one can hardly ask for a more carefully and completely ordered series of facts about our commodity prices than they contain. Accordingly, I have picked out from their copious list 56 articles which, I believe, will represent, as closely as is possible under the circumstances, the same number selected by Mr. Sauerbeck for England. Like Mr. Sauerbeck, I give 22 articles under "Food" and 34 under "Materials," but there is a difference of one article more or less in all but one of the sections. Another modification of no importance is that I have included "Sugar, Coffee, and Tea" under "Vegetable Food" instead of giving them a section apart, as Mr. Sauerbeck has done.

The greatest difficulty, however, in following the English model has come from the fact, which I have discussed elsewhere, that four-fifths of the Labor Bureau's articles ar "manufactured," only 50 out of 259 being classified by the authors as "raw," while in Mr. Sauerbeck's tables 36 out of 56, or about two-thirds, are "raw" by the same classification. I have consequently been able to use, from the Labor Bureau list, only 11 "raw" commodities out of the 22 under "Food," and 16 out of the 34 under "Materials"; that is, about one-half of the total. In several instances, in order to keep Mr. Sauerbeck's weighting of an article unchanged, I have had to substitute a "manufactured" for a "raw" form; but even this has not always been practicable. Where some of Mr. Sauerbeck's commodities have been wholly omitted from the Labor Bureau list, I have had to replace them by others in the same group and of analogous importance.

The following tables, where my proposed method is presented, show Mr. Sauerbeck's lists of articles, alongside of their American representatives, so that the differences mentioned above can be studied in detail. As to the prices for the various articles, I have simply copied the Labor Bureau's respective index-numbers for the years 1897, 1904, and 1905, the average prices for the years 1890–99 being taken as 100. In this way not only can the percentages of advance between 1897 and 1905, according to this new method, be compared with those shown by the Labor Bureau's and Messrs. Dun's figures in the foregoing paper, but similar comparisons are continued for another year. For the sake of record I have added Mr. Sauerbeck's comparative index-numbers with the respective rates of advance since the English lowest price level in 1896.

TABLE I. FOOD.

Mr. Sauerbeck's English List.	American List selected from Labor Bureau's Tables.	Labor Bureau's Index-Numbers.		
		1897.	1904.	1905.
Vegetable Food. (*including Sugar, Coffee, and Tea*).	*Vegetable Food.* (*including Sugar, Coffee, and Tea*).			
Wheat, English gazette	Wheat, contract cash	105.8	138 3	134.5
Wheat, American	Wheat flour, spring patents	106.8	125.2	126.2
Flour, town-made white	Wheat flour, winter patents	113.4	125.5	118.1
Barley, English gazette	Barley, by sample	71.2	116.9	107.0
Oats, English gazette	Oats, cash	67.9	135.8	111.2
Maize, American mixed	Corn, No. 2, cash	66.9	132.6	131.7
Potatoes, good English	Corn-meal, fine white	77.8	127.8	126.4
Rice, Rangoon cargoes	Corn-meal, fine yellow	75.1	131.1	130.3
Sugar, British W. Indian refining	Rye, No. 2	74.9	133.4	134.5
Sugar, beet, 88% f. o. b.	Potatoes, Burbank	65.7	146.3	80.7
Sugar, Java, floating cargoes	Sugar, 89° fair refining	90.6	102.1	108.8
Coffee, Ceylon low middling	Sugar, 96° centrifugal	92.1	102.7	110.6
Coffee, Rio, good channel	Coffee, Rio, No. 7	60.4	59.6	63.4
Tea, common congou	Tea, Formosa fine	98.6	97.1	94.2
Tea, average import price (15 articles)	Totals for 14 articles	1,167.2	1,674.4	1,577.6
	Averages	83.4	119.6	112.7
Animal Food.	*Animal Food.*			
Beef, prime	Beef, steers (average of 2)	99.5	110.8	111.2
Beef, middling	Beef, fresh, native sides	99.7	106.1	104.0
Mutton, prime	Beef, salt (average of 3)	103.9	113.9	117.6
Mutton, middling	Mutton, sheep (average of 2)	94.2	109.0	131.5
Pork, average large and small	Mutton, dressed	96.6	103.2	113.9
Bacon, Waterford	Pork, hogs (average of 2)	82.8	116.6	120.1
Butter, Friesland fine to finest (7 articles)	Bacon (average of 2)	79.8	115.1	118.9
	Butter (average of 3)	84.1	98.4	112.8
	Totals for 8 articles	740.6	873.1	930.0
	Averages	92.6	109.1	116.3
	Total Food.			
	Vegetable food, 14 articles	1, 167.2	1,674.4	1,577.6
	Animal food, 8 articles	740.6	873.1	930.0
	Totals for 22 articles	1,907.8	2,547.5	2,507.6
	Averages	86.7	115.8	114.0

TABLE II. MATERIALS.

Mr. Sauerbeck's English List.	American List selected from Labor Bureau's Tables.	Labor Bureau's Index-Numbers.		
		1897.	1904.	1905.
Minerals.	*Minerals.*			
Iron, Scotch pig	Pig iron (average of 4)	78.0	103.7	124.0
Iron, bars	Bar iron, Pittsburg best refined	75.9	102.1	129.0
Copper, Chili bars	Copper, ingot, Lake	91.7	106.2	127.7
Copper, English tough cake	Copper, sheet, hot-rolled	88.2	108.5	120.1
Tin, Straits	Tin, pig	74.0	152.5	170.3
Lead, English pig	Lead, pig	94.0	116.3	125.7
Coal, Wallsend	Coal, anthracite (average of 4)	102.9	130.4	130.1
Coal, average export price (8 articles)	Coal, bituminous, f. o b. New York	89.0	116.5	114.8
	Totals for 8 articles	693.7	936.2	1,041.7
	Averages	86.7	117.0	130.2
Textiles.	*Textiles.*			
Cotton, middling uplands	Cotton, middling uplands	92.2	155.9	123.1
Cotton, fair Dhollerah	Cotton yarns, cones 10/1	90.3	123.2	107.8
Flax, St. Petersburg best	Cotton yarns, cones 22/1	90.8	115.7	103.5
Flax, Russian, average import	Jute, raw	103.9	123.7	151.0
Hemp, Manila fair roping	Wool, Ohio fine fleece	89.7	124.2	137.4
Hemp, St. Petersburg clean	Wool, Ohio medium fleece	87.6	106.7	117.2
Jute, good medium	Worsted yarns, 2.40's Australian	83.6	116.6	123.0
Wool, merino, Port Phillip av.	Worsted yarns, 2.40's XXX	81.3	116.3	126.4
Wool, merino, Adelaide av.	Silk, Italian	85.5	90.8	96.5
Wool, English, Lincoln hlf. hogs	Silk, Japan filatures	86.2	90.6	99.3
Silk, Tsatlee (11 articles)	Totals for 10 articles	891.1	1,163.7	1,185.2
	Averages	89.1	116.4	118.5
Sundry Materials.	*Sundry Materials.*			
Hides, River Plate, dry	Hides, green salted	106.3	124.4	152.6
Hides, River Plate, salted	Leather, sole, hemlock, Buenos Ayres	104.8	116.5	118.1
Leather, crop hides, 30/45 lbs.	Leather, sole, oak	91.6	102.6	108.9
Tallow, St. Petersburg Y. C.	Tallow	76.3	105.5	103.2
Tallow, town	Oil, cotton-seed	77.7	103.0	88.6
Oil, palm	Oil, linseed, raw	72.2	91.7	103.1
Oil, olive	Seeds, flaxseed No. 1	78.1	99.6	107.6
Oil, linseed	Petroleum, crude	86.5	178.8	152.1
Seeds, linseed	Petroleum, refined for export	92.0	127.3	111.2

TABLE II. MATERIALS,—*Continued.*

Mr. Sauerbeck's English List.	American List selected from Labor Bureau's Tables.	Labor Bureau's Index-Numbers.		
		1897.	1904.	1905.
Sundry Materials.	*Sundry Materials.*			
Petroleum, refined	Manila rope	67.6	125.4	127.9
Soda, crystals	Rubber, Para Island	105.6	135.8	155.2
Nitrate of soda	Wood alcohol, 95%	72.9	61.6	70.8
Indigo, Bengal good	Tar	87.5	139.4	145.9
Timber, hewn, average import	Timber, spruce	97.6	142.9	149.3
Timber, sawn or split, average (15 articles)	Timber, white oak, plain	96.8	124.2	126.5
	Timber, yellow pine	89.0	116.0	134.9
	Totals for 16 articles	1,402.5	1,894.7	1,955.9
	Averages	87.7	118.4	122.2
	Total Materials.			
	Minerals, 8 articles	693.7	936.2	1,041.7
	Textiles, 10 articles	891.1	1,163.7	1,185.2
	Sundries, 16 articles	1,402.5	1,894.7	1,955.9
	Totals for 34 articles	2,987.3	3,994.6	4,182.8
	Averages	87.9	117.5	123.0

TABLE III. SUMMARY.

Total Food 22 articles	1,907.8	2,547.5	2,507.6
Total Materials 34 articles	2,987.3	3,994.6	4,182.8
Grand total 56 articles	4,895.1	6,542.1	6,690.4
General averages	87.4	116.8	119.4

TABLE IV.

COMPARISON OF THREE METHODS OF AMERICAN INDEX-NUMBERS.

(*See Tables in Foregoing Paper.*)

Authors.	1897.	1904.		1905.	
	Index-Numbers.	Index-Numbers.	Percentage of Advance since 1897.	Index-Numbers.	Percentage of Advance since 1897.
Labor Bureau.					
Food	85.5	110.9	29.7	111.6	30.5
Other than Food	90.5	113.6	25.5	117.3	29.6
Grand totals	89.7	113.0	26.0	115.9	29.2
*Dun.**					
Food	82.7	120.3	45.5	118.3	43.0
Other than Food	89.2	117.4	31.6	121.5	36.2
Grand totals	86.0	118.8	38.1	119.3	38.7
Present Writer.					
Food	86.7	115.8	33.6	114.0	31.5
Other than Food	87.9	117.5	33.7	123.0	39.9
Grand totals	87.4	116.8	33.6	119.4	36.6
	1896.	1904.		1905.	
Mr. Sauerbeck's English Comparative Index-Numbers.					
Food	90.5	99.3	9.7	100.7	11.3
Materials	93.9	112.7	20.1	117.4	25.0
Grand totals	92.4	106.1	14.8	110.0	19.0

Neither time, nor my allotted space, will admit of any analysis of these new combinations of Labor Bureau figures. Indeed, my sole object in preparing these notes has been to furnish some materials for forming an opinion as to how far Mr. Sauerbeck's method of index-numbers can be usefully applied to American conditions.

* In this table Messrs. Dun's figures for 1904 and 1905 are calculated from their twelve monthly averages for each year, instead of from their published figures for each July 1, as was necessary for the period covered by the foregoing paper.

REVIEWS AND NOTES.

STATISTICS OF HEREDITY.

One of the most significant recent contributions to biology is a book entitled "Mental and Moral Heredity in Royalty," by Frederick Adams Woods (Henry Holt & Co., New York), in which scientific modern methods are applied to the more complex problems of inheritance. The author has used for his material 832 members of the reigning families of Europe, and has classified them into ten grades for mental, and ten grades for moral qualities. The classification is made, as far as possible, impersonal, being based solely on the printed estimates of a certain set of authorities chosen before the inception of the work. The clear and concordant results obtained furnish evidences of the general soundness of the method. Dr. Woods finds first an important correlation between mental and moral traits, about .3 as worked out by Pearson's method. This is nearly the same as the correlation between strength of pull and weight. Furthermore, a distinct correlation appears between moral qualities and the number of offspring reaching adult life,—a hopeful sign for the future of the race. Comparing different generations, it appears that the correlations in intellectual power follows Galton's theory very closely, being .3007 for parent and offspring, .1606 for grand-parent and offspring, and .1528 for great-grand-parent and offspring, to be compared with theoretical values of .3, .15, and .075, respectively. For moral qualities a similar relation holds. The application of scientific methods in a new and difficult field makes this book a notable one. The reviewer commends it to psychologists, historians, and particularly to social reformers, as well as to statisticians.

A paper by Sir W. R. Gowers on "Insanity and Epilepsy in Relation to Life Insurance" in the *Medical Examiner and Practitioner* for January, 1905, with a discussion in the March and April numbers of the same journal, suggests an important line of statistical research, as yet almost unworked. The point of Dr. Gowers's original communication was that many forms of insanity are not associated with such general pathological defects as to shorten life and make their victims undesirable insurance risks. Ignoring the distinction between the widely different causes which may lead to the symptoms of mental

derangement, it was shown by Dr. Robert Jones in the subsequent discussion that the general death-rate for the insane in hospitals is six times that of the normal population. This difference is naturally greatest at the earliest age periods, and the insane rate is only twice that for normal persons, over 85. A most suggestive fact is mentioned by the same observer,—that of 200 insane persons of suicidal tendencies, 55 showed a history of hereditary insanity in the direct line, and 55 more in collateral lines. Accurate determinations of hereditary correlations for different types of mental disorder should be of much practical value.

C.-E. A. WINSLOW.

FOREIGN VITAL STATISTICS.

Census of London.—A quinquennial census of the administrative county of London and the city of London is taken this year. A similar census in 1896 proved of such value in the apportionment of rates among the various boroughs as to warrant its repetition. The questions asked will be simple, including only the name, sex, and age of the person and his or her relation to the head of the family. Such a determination of the fundamental facts of population, as the *Standard* points out, is not only needful for the equalization of rates, but "will also be of great value to the Council in other various branches of its work, such as the housing of the working classes, education, locomotion, and public health, and of no less value to the metropolitan borough councils and the guardians of the poor."

Newsholme on Measles and Diarrhœa.—The Annual Report of the Medical Officer of Brighton, England, in 1904, makes several contributions to our knowledge of the etiology of measles. As in other communications, Dr. Newsholme points out the cyclical changes in the prevalence of this disease, epidemics occurring every second or third year, and large epidemics at intervals from five to nine years apart. An important point in the present outbreak is the absence of a single death in a child over six years of age. 270 cases were reported at ages over six, while under six years there were 964 reported cases and 94 deaths. Evidently, the disease is only serious among very young children. From a study of the history of certain families which moved into houses in which cases of measles had occurred earlier in the epidemic, the author concludes that special disinfection in this disease is unnecessary.

The same report contains a table which is interesting because it confirms so well the classic Berlin statistics which show the relation

between milk and the diarrhœal diseases of children. The Brighton figures are shown in the following table, the percentage of children dying from diarrhœa, classified according to method of feeding, being compared with the percentage of normal children using each food as determined by a house-to-house canvas of 608 infants living in 5,358 houses in the poorer streets of the town. The malign influence of cow's milk and condensed substitutes is strikingly shown.

PERCENTAGE OF INFANTS UNDER ONE YEAR OF AGE FED IN DIFFERENT WAYS.

	608 Living Infants.	87 Infants dying of Diarrhœa.
I. Suckled only	62.8	8.0
Suckled and farinaceous food	10.4	3.4
Suckled and cow's milk	1.8	1.2
Suckled and condensed milk	1.0	1.2
II. Cow's milk only	7.1	32.2
Cow's milk and farinaceous food	9.2	11.5
III. Condensed milk only	3.6	32.2
Condensed milk and farinaceous foods	2.1	3.4
IV. Patent foods only mentioned	1.2	1.2
V. Farinaceous foods only mentioned	.8	
VI. Unknown		5.7

South African Statistics.—The Report of the Registrar-General of Statistics for Cape of Good Hope promises on first inspection suggestive comparative vital statistics for the varied races represented in that colony. It is apparent, however, that the wise and necessary toleration which British colonial administrators accord to native prejudice interferes seriously with the collection of adequate data. Furthermore the methods of calculation adopted are marked by conscientious ignorance of statistical science. Great labor has been expended in calculating the ratio which the number of deaths or births among one race bears to the total number of deaths, the ratio which the number of deaths in the cities bears to the number in the country for each race, and other irrelevant matters, but death-rates and birth-rates for races and localities are almost wholly ignored, although population data were evidently at hand for their calculation. The birth-rate for the whole colony (29.87) appears normal, and the fact that 30% of the deaths occur under one year and over 40% under five years suggests the need for sanitary reform. Under Marriages a new and important line of statistical

research is opened by a calculation which shows that Tuesday is the favorite day for matrimony, Monday coming next and Friday last!

Statistics of Rhenish Cities.—A cheering contrast to this report is found in the *Jahrbuch des statistischen Amtes der Stadt Elberfeld für* 1903 *und* 1904, Teil 1. We may equal the Germans in other fields, but their statistics are likely to remain supreme for some time to come. The volume under consideration deals only with vital and property statistics, and includes 91 pages of original tables besides 43 pages of able analysis. For each important factor comparative rate tables are furnished, including, with Elberfeld, the six other large Rhenish cities, Barmen, Essen, Düsseldorf, Cöln, Crefeld, and Aachen. For marriages, births, and deaths these tables cover ten years. In both births and deaths a steady fall is manifest. Essen has had the highest birth-rate, ranging from 44.2 in 1895 to 43.1 in 1904, and Crefeld the lowest, ranging from 32.9 to 26.5. In death-rates, Aachen was highest in 1895, with a rate of 24.7 in 1895, and Cöln led with 21.0 in 1904. Barmen has been lowest, 17.5 in 1895, and 15.5 in 1904. All of the cities except Essen and Aachen exhibit a slightly increasing marriage-rate. The ratio of deaths under one year to births, for Elberfeld, was only 16.9 in 1903, and 15.8 in 1904. The mortality among older children (1–10) was notably affected by a diphtheria epidemic, which in 1903 caused 13 cases in every 1,000 inhabitants. The latter portion of the volume deals with real estate, personal property, animal property, and labor, statistics of the industrial forces of the community being based on the returns made in connection with the state system of Workmen's Insurance.

Yellow Fever at Havana.—The Statement of Mortality for the Month of December, 1905, issued by the Local Board of Health of the city of Havana, contains an interesting study of the yellow fever epidemic of 1905. Since Major Reed and his associates stamped out the disease in 1901, the city has been free from it. Last year infection was introduced in the dock district, apparently by mosquitoes imported from New Orleans. Three cases occurred in October, including a Spaniard employed about the wharves and two Italian actors, who landed from Genoa via New York. In November 14 cases followed, and in December 26, with 24 deaths in all. The vigorous measures of the health authorities proved effective, as shown by the fact that, out of 34 streets in which cases occurred, 22 showed only one house infected, and 5 only two. Of 60 infected houses, 55 showed only one case, each. C.-E. A. Winslow.

MUNICIPAL STATISTICS.

The Death-rate of Manchester, N.H.—The Report of the Board of Health of the City of Manchester, N.H., for 1904 shows a general death-rate of 16.22. In 1900 the population of the city was 56,987, and, the actual number of deaths decreasing in 1901 and 1902, it was estimated that this population remained stationary. In 1903 the actual number of deaths slightly increased, and the "estimated population" was raised to 60,000, showing a steady fall in the death-rate. In 1904 a further reduction was apparently desirable, and the population was placed at 62,000, with the gratifying result noted above. The ratio of 47 deaths of children under 5 to 100 total deaths (56 in 1902) suggests something serious the matter, although age distribution figures and birth-rates are not given in this report.

Tuberculosis and Pneumonia in Boston.—The Annual Report of the Registry Department of the City of Boston for the Year 1904 exhibits the merits and defects of preceding volumes. Its analyses of the statistics for individual wards in relation to racial and social conditions are, as usual, most suggestive. It may be interesting to cite the figures for the five wards having the least and the five wards having the greatest, density of population, in order to show the high birth-rates and death-rates and the large proportion of foreign population in the congested districts.

WARD STATISTICS OF BOSTON, 1904.

LEAST CONGESTED WARDS.

Ward.	Dwellings to the Acre.	Persons to a Dwelling.	Percentage of Foreign-born Population.	Birth-rate.	Death-rate.	Percentage of Deaths under 1 yr.
25 . . .	1.4	5.5	30	24.5	13.0	2.5
24 . . .	2.1	6.4	27	22.4	13.7	4.3
23 . . .	1.9	6.5	31	19.0	12.3	2.8
20 . . .	3.2	6.5	26	23.6	14.0	4.2
11 . . .	4.7	6.9	32	12.5	13.4	1.4

MOST CONGESTED WARDS.

7 . . .	3.1	12.3	45	22.4	24.2	2.9
3 . . .	3.7	12.9	29	26.3	16.3	3.4
9 . . .	9.9	14.6	40	21.4	16.8	3.8
8 . . .	11.4	16.6	49	32.3	12.2	4.0
6 . . .	5.2	22.1	59	45.9	17.4	9.3

The "summary of vital statistics for the years from 1850 to 1900" which was promised last year does not appear in this report, but a significant table is included, which shows the deaths from tuberculosis, pneumonia, cancer, heart disease, and apoplexy since 1811. The report, as usual, omits death-rates, but the following table shows the rates calculated for census years by the reviewer. Allowing for all errors in diagnosis and reporting, the increase in heart disease is striking.

DEATH-RATE FROM CERTAIN CAUSES IN BOSTON IN CENSUS YEARS.

DEATHS PER 1,000.

Year.	Tuberculosis.	Pneumonia.	Cancer.	Heart Disease.	Apoplexy.
1820 . . .	5.1	.6	.0	.2	.2
1830 . . .	3.1	1.1	.1	.2	.2
1840 . . .	2.6	1.4	.2	.2	.3
1850 . . .	4.3	.9	.2	.4	.2
1860 . . .	4.5	1.6	.3	.5	.2
1870 . . .	4.0	1.3	.4	.8	.4
1880 . . .	3.8	2.2	.7	1.2	.6
1890 . . .	3.6	2.4	.8	1.7	.7
1900 . . .	2.5	2.5	.7	2.0	.9

The inverse relation between tuberculosis and pneumonia which is so common a phenomenon appears with striking clearness here, the latter increasing in almost the same ratio in which the former decreases. Such a condition suggests that the decline of tuberculosis is in part not a real one, but is due rather to changed diagnosis, deaths once reported from tuberculosis being now classed as pneumonia. It might be held that persons with a naturally sensitive respiratory apparatus, who had been saved from tuberculosis by sanitary reform, would be apt to die of pneumonia at a later age, and thus swell the death-rate from the latter disease. A study of age distribution should throw light on this point. The reviewer has therefore prepared the subjoined table, showing the age distribution of the two causes of death, by adding the figures given for twenty-five individual wards:—

AGE DISTRIBUTION OF DEATHS FROM TUBERCULOSIS AND PNEUMONIA.

BOSTON, 1904. ACTUAL DEATHS AT EACH AGE PERIOD.

Age.	Under 1.	1.	2–4.	5–9.	10–14.	15–19.	20–24.
Tuberculosis	28	12	21	16	13	76	157
Pneumonia	281	162	78	26	8	11	35

Age.	25–29.	30–34.	35–39.	40–44.	45–49.	50–54.	55–59.
Tuberculosis	196	190	167	114	77	68	36
Pneumonia	50	71	75	65	64	76	80

Age.	60–64.	65–69.	70–74.	75–79.	80–84.	85–89.	90–94.	Over 94.
Tuberculosis	32	26	19	9	2	1		
Pneumonia	71	66	71	53	31	17	6	1

Evidently, the present age distribution of the two diseases is totally different. 7% of the deaths from tuberculosis occur under 15 years against 40% of the deaths from pneumonia. The period from 15 to 40 includes 62% of the deaths from tuberculosis, and only 17% of the deaths from pneumonia. 31% of the deaths from tuberculosis and 43% of the deaths from pneumonia are at ages over 39. If now one refers to Dr. Abbott's admirable study of the "Decrease of Consumption in New England" in this journal for March, 1904, it appears that the great diminution of phthisis has occurred at precisely those age periods at which pneumonia is now most frequently reported. Thus from 1860 to 1900 the male phthisis death-rate per 1,000 under 5 years fell from 2.1 to .8 and between 70 and 79 years from 9.8 to 2.5 while between 20 and 29 years it decreased only from 4.4 to 2.8. It seems desirable that our tuberculosis and pneumonia statistics should be thoroughly overhauled in order to see if the decrease in consumption on which we pride ourselves is not in part illusory. In the case of Boston the changing racial constitution of the population might naturally lead to a rise in the death-rate from respiratory diseases among young children, since certain of the immigrant races are especially susceptible to these maladies. It is noteworthy that the

largest mortality from pneumonia occurs in just those wards which have the largest foreign population.

Pneumonia in Cambridge. In connection with the discussion of the relation between tuberculosis and pneumonia, the Annual Report of the Board of Health of the City of Cambridge, Massachusetts, for the year 1905, is of interest. It shows that in Cambridge, where there is not a large foreign population, the death-rate from pneumonia has remained unchanged at a low level, while the death-rate from tuberculosis has shown a normal decrease. The number of deaths from pneumonia per 1,000 persons living was 1.91 in 1896 and 1.86 in 1905. The statistics published in this report are always sound and helpful and concise. They might well be made somewhat more extensive.

Ohio Municipal Statistics.—The State of Ohio possesses an admirable institution in the Bureau of Inspection and Supervision of Public Offices, created by an act of April 25, 1904, to "formulate, prescribe, and install a system of accounting and reporting . . . that shall be uniform for every public office and every public account of the same class, and which shall exhibit true accounts and detailed statements of funds collected, received, and expended for account of the public for any purpose whatever." This Bureau has recently issued a report entitled "Comparative Statistics, Cities of Ohio, 1904," which is full of meat for the student of urban administration. It is wholly financial in scope, including the receipts and expenditures, ordinary and extraordinary, for each of the 71 cities in the State, classified, with considerable detail, in eight tables covering 160 pages.

Causes of Death in Providence.—An important contribution to the interpretation of vital statistics is made by Dr. C. V. Chapin in a review of "Causes of Deaths in Providence, 1856–1905," in the *American Journal of Public Hygiene* for February, 1906. The average rates for each disease and the increase or decrease observed in comparing the decades, 1856–65 and 1896–1905, are given in tabular form. Typhoid fever, scarlet fever, small-pox, and diphtheria and croup all show a marked decrease, amounting in the aggregate for the four diseases to 214 per 100,000, one-quarter of which the author considers may be due to a change in the age distribution of the population and the rest largely to the efforts of the sanitary authorities. Tuberculosis also shows a real diminution of 169 per 100,000. With regard to diarrhœal diseases, on the other hand, Dr. Chapin holds

that the apparent decrease of 79 deaths per 100,000 may be due merely to a decrease in the proportion of young children in the population. Strong evidence to this effect is furnished by the fact that the ratio of deaths under one, to births has shown an increase. With regard to measles, whooping-cough, and cerebro-spinal meningitis it does not appear that sanitary measures have produced, or can as yet produce, any appreciable effect. In a number of diseases apparently decreased death-rates are attributed almost wholly to change in diagnosis. Under this heading come diseases of the brain, convulsions, hydrocephalus, debility, teething, old age, dropsy, and unknown causes. Dr. Chapin considers the apparent increase in cancer, heart disease, and renal disease as largely or wholly due to transfers from the more indefinite causes of death and to change in the age distribution of the population.

The apparent increase in pneumonia and bronchitis does not escape the author's pervading scepticism, being attributed to "changes in age constitution, improved diagnosis, and the influenza bacillus." The reviewer is inclined to believe, as stated previously, that other factors may affect the increase in pneumonia, especially among young children. Influenza and cerebro-spinal meningitis have shown an undoubted increase in Providence, and it is a somewhat sinister fact that suicides and homicides have more than doubled. Here, too, changes in the race constitution of the population may play a part.

C.-E. A. Winslow.

STATE SANITARY REPORTS.

Indiana.

The Twenty-second Annual Report of the State Board of Health of Indiana for 1903 bears upon its cover the inscription, "Public health is public wealth," and, within, exhibits a wise combination of sound science with an appeal to popular interest, often an admirable characteristic of the sanitary literature of the Middle Western States. For each of the principal causes of death diagrams have been prepared to show age incidence and seasonal prevalence which have an important educational value. The general death-rate for the State is given as 13.4, calculated on the basis of the population in 1900, and the birth-rate is given as 17.5. The returns of deaths are said to be practically complete, but it is estimated that only half the births are reported. No doubt the

returns of births are inadequate, yet the assumption that they should be doubled seems hardly warrantable, since the birth-rates in American States are rarely much over 25, and in States with a considerable rural population are lower still. The ratio of deaths under one year to total births appears, from the figures in the Indiana report, to be 17.2. This is not such a high value as to suggest a marked discrepancy between the reporting of births and deaths. Among the causes of death, phthisis is far in the lead. Infantile diarrhœa and diseases of infants are high, and typhoid fever is excessive, accounting for 40 deaths per 100,000 population. These facts call urgently for support of the sanitary efforts which Dr. Hurty is making. Appendices to the report contain a full tabulation of deaths by causes and months, by causes and ages, by causes and race (white, colored, American, foreign), and by causes and social condition. The causes of death are classified according to the International System, and the figures should prove of value in comparative studies.

Massachusetts.

A new series of *Monthly Bulletins of the State Board of Health* of Massachusetts began with January, 1906. Each number is a pamphlet of 20–30 pages, including under the head of vital statistics the weekly returns of deaths from cities and towns of more than 10,000 population. The accuracy of the system of reporting is indicated by the statement that, although "the number of deaths reported each week does not correspond exactly with the number which occurred during that week," "the discrepancy is a slight one in most cases." In the tables are given the number of deaths under five years, and the deaths from principal infectious diseases, acute lung diseases, phthisis, diphtheria, typhoid fever, and measles. It would be well to specify in each number just what causes of death are included under the headings Principal Infectious Diseases and Acute Lung Diseases. For the month of March about 30 per cent. of the total deaths occurred under five years of age, and about 9 per cent. of the total deaths were due to phthisis. The *Bulletin* includes also much valuable information in regard to the adulteration of foods and drugs and reports on significant outbreaks of epidemic disease.

Michigan.

Another document which shows an able expert struggling with poor raw material is the Thirty-fifth Annual Report of the Secretary of State on the Registration of Births and Deaths, Marriages and Di-

vorces, in Michigan for the Year 1901. Dr. Cressy L. Wilbur naturally makes all that can possibly be made out of his figures, and acknowledges what cannot be done with candor. The death-rate for the State ranged from 7 to 10 prior to 1898, and jumped in that year to 12 with a new registration law. The present rate of 13.4 is thought to be fairly accurate. Birth statistics are still collected by supervisors and assessors,—a system said to be "grossly defective." Still-births are in this report for the first time separated from deaths, but are included as births on the ground that the birth returns are in any case so imperfect as to be of little or no value. An interesting feature of the report is a set of tables of comparative rates for births, marriages, and deaths for a number of foreign countries and American States. While fully comprehending the importance of correcting such crude rates for age and race constitution and other factors, Dr. Wilbur rightly holds that they "must always form the first step in the comparative study of vital statistics." The calculation of death-rates by months, causes, etc., in the smaller divisions of the State is less useful; thus in Table XIV, on page 71, we find set down a cancer death-rate of 12.8 per 100,000 for a certain group of cities in the month of November. This rate is based on a single death. In September of the same year there were eight deaths from cancer in the same population, giving a rate of 102.6! Even if the November deaths had fairly represented the year, the result would be of little value when founded on so small a base.

The Michigan figures show a much better condition as regards typhoid fever than do those for Indiana. The rate in the former case is only 26.3. Influenza was a very serious factor in the death-rate in 1901, causing more deaths than measles, scarlet fever, whooping cough, and diphtheria, all combined.

Ohio.

The Nineteenth Annual Report of the State Board of Health of the State of Ohio for 1904 contains only a brief analysis of death returns in the way of vital statistics. Deaths from the chief causes are tabulated by months for the cities of over 5,000 population, and the yearly results are exhibited for the villages and townships as well. As in the Michigan report before referred to, the calculation of death-rates for small districts where the basis is inadequate is subject to chance errors of great magnitude. Thus on page 602 it appears that the death-rate per 1,000 in Springfield is .88 (one death in a population of 1,135), and in Weston 39.45 (26 deaths in a population of 659).

Without figures for the age distribution of the population it is of course impossible to make accurate comparisons, but the crude death-rates for the three classes of administrative units are suggestive. The cities show a rate of 15.39 per 1,000 against 11.09 for the villages, and 7.32 for the townships. Deaths under one year make up 17% of the total deaths in the cities, 9% in the villages, and 7% in the townships. The death-rate from typhoid fever for the State appears to be very high, 41 per 100,000.

Rhode Island.

To review The Fifty-first Report relating to the Registry and Return of Births, Marriages, and Deaths, and of Divorce in the State of Rhode Island for 1903 is a pleasant task, for the Rhode Island reports are certainly the best registration reports published by any State in the Union. The original data are of good quality, and always well handled. The percentage of the total deaths reported from unknown causes has fallen to less than .5, from 10.7 in 1856–60.

The crude birth and death rates for the State are both probably fairly accurate, and the birth-rate for 1903, 25.3, serves as a fair standard for estimating the imperfection of such rates as those reported for Michigan and Indiana. Since 1869 neither rate has changed materially. Comparing the five year periods, 1869–73 and 1899–1903, the birth-rate has risen from 25.0 to 25.5, and the death-rate from 16.5 to 18.5. Both increases are no doubt partly due to the improvement in registration. The yearly birth-rates appear to be omitted from the original report, only the curious inverse ratio of the population to one birth being given, and in the table in question, on page 119, there are a number of obvious misprints, apparently proof errors.

With regard to the prevalence of individual diseases the most important comparative data are the ratios to total deaths, which are given by counties for 1903 and for the important causes by five-year periods since 1866. Such ratios are often severely criticised as comparisons of two independent variables, yet the reviewer is of the opinion that they may often have great practical value. Even in the case of the counties and other divisions of the State which are compared in Table IX the ratios of the more prevalent individual diseases are suggestive, if the death-rates from all causes be borne in mind as well, although the number of deaths from many causes is of course too small to warrant any conclusions. The conditions of the city of Woonsocket appear to be somewhat peculiar. Influenza

is very low, but lung tuberculosis, bronchitis, pneumonia, and broncho-pneumonia are all excessive, accounting together for over 27% of the total deaths. The proportion of deaths from diarrhœal diseases of children is also excessive. The ratio of deaths from a certain cause to total deaths is certainly significant where the crude death-rate does not vary appreciably, as in the State of Rhode Island as a whole, and the ratios given for individual diseases for the last forty years yield much information. Thus the ratio for typhoid fever has fallen from 4.2% of the total deaths in 1866–70 to 1.2% in 1896–1900. A comparison of the ratios for tuberculosis, pneumonia, and bronchitis brings out the inverse relation of the former, as compared with the two latter diseases, which has been noted between tuberculosis and pneumonia in Boston. Only a careful study of age distribution can make the meaning of this relation quite clear.

CONSUMPTION, PNEUMONIA, AND BRONCHITIS IN RHODE ISLAND.

Per Cent. of Total Deaths.

Period.	1866–70.	1871–75.	1876–80.	1881–85.	1886–90.	1891–95.	1896–1900.
Consumption	17.7	14.0	14.7	14.4	12.2	10.4	11.8
Pneumonia .	6.0	6.5	7.0	7.3	7.9	9.2	9.3
Bronchitis. .	.6	.8	1.6	2.2	3.5	3.9	3.4
Total . . .	24.3	21.3	23.3	23.9	23.6	23.5	24.5

One respect in which the Rhode Island reports are quite unique is the fact that they contain an analysis of mortality statistics by occupation. With the growth of industrial life, factory sanitation is becoming one of the most important problems in sanitary science, yet with the exception of a brief report of the Massachusetts State Board of Health and the imperfect data in the United States Census we almost wholly lack any exact knowledge of American conditions. Table XI and Table XCV of the report under consideration are devoted to this subject, and show the average age at death for each occupation for the years 1903 and for the period of 51 years and 7 months from June 1, 1852, to January 1, 1904. The figures presented for the single year are founded on so small a base as not to be of great value in most cases, and even for the long period conclusions can only be drawn with the greatest caution. In the first

place the number of persons dying in certain occupations, even in fifty years, is too small to yield results free from chance errors. Thus it appears from the table that art is the most dangerous of all trades, the average age at death being only 32.1 years. This average is founded on only 49 cases. On the other hand, the second most healthy occupation appears to be that of calkers, sixteen decedents having an average age of 69.6 years. The characteristic age distribution of certain occupations markedly affects the results. Thus sailors average 49.0 years at death, and sea captains 70.8!

Maine.

The Eleventh Annual Report upon the Births, Marriages, Divorces, and Deaths in the State of Maine for 1902 shows some interesting contrasts with certain of the reports previously considered, representing as it does a population largely native and rural. Rates are calculated on the 1900 population, perhaps fairly accurate, since the State gained only about 5% in the decade 1890–1900.

Both the birth-rate and the death-rate are lower than in Rhode Island. Since 1894 the former has varied between 20.10 and 22.23, the latter between 15.37 and 16.99. 60% of the births in this State are still of native parentage against about 40% in the cities. The proportion of native births for the whole State of Rhode Island, on the other hand, is only 30%. The ratio of divorces in Maine is a sinister figure, one divorce to every 6.5 marriages.

The latter part of the report is devoted to a valuable analysis of deaths from the more important causes by season and by age. Table 35 based on the figures for 11 years shows the seasonal variation of the infectious diseases so well that it seems worth while to extract certain features from it. The appended table brings out the contrast between typhoid and diarrhœa in which the favoring influence of warm weather on the parasite is the controlling factor and the lung diseases where the lowering effect of cold weather on the vital resistance of the host seems paramount. Diphtheria of course follows the opportunities of infection offered by the school term.

SEASONAL PREVALENCE OF CERTAIN DISEASES IN MAINE, 1892-1902.

Ratio of Mortality for Each Month to Annual Mortality.

Disease.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Typhoid Fever	85	81	93	71	68	62	56	98	160	181	130	111
Infantile Diarrhœa	13	14	14	19	16	33	169	391	351	130	26	16
Consumption. .	101	104	118	115	115	103	95	89	88	92	86	93
Pneumonia . .	192	179	192	154	114	63	27	24	36	58	79	10
Bronchitis . . .	154	159	148	141	118	80	55	37	54	81	81	100
Diphtheria and Croup . . .	118	116	73	77	84	64	67	58	84	127	145	142

With regard to the causes of death Maine exhibits certain peculiarities. The largest factor in the mortality is "brain disease," a complex of a number of special causes, some nervous in origin and some due to pathological condition in the circulatory system. Pneumonia now comes next, having risen from fourth place, passing consumption and heart disease during the last ten years. The actual death-rate from lung diseases is low, 1.4 per 1,000 for consumption, 1.4 for pneumonia, and .3 for bronchitis. Infantile diarrhœa is also low, amounting only to .5 and the ratio of deaths under one to total births is very low, only 10.6. Cancer, on the other hand, is very prevalent, causing a death-rate of .9 per 1,000. Many of these phenomena must be accounted for by the peculiar age distribution of the population. No statistics are given to show this point, but in the appended table the reviewer has compared the age distribution of the deaths with that in Boston, as shown by the registration report for 1902.

AGE DISTRIBUTION OF DEATHS IN THE STATE OF MAINE AND THE CITY OF BOSTON, 1892. ACTUAL DEATHS.

Age.	Under 1.	1-5.	5-9.	10-19.	20-29.	30-39.	40-49.	50-59.	60-69.	70+
Maine .	1,433	590	207	463	793	673	716	957	1,490	3,289
Boston .	2,268	1,108	253	373	1,027	1,276	1,097	1,116	1,210	1,369

Evidently, the age distribution of the two populations must be radically different, and a calculation of death-rates by age periods ought to show extraordinarily low death-rates for the State of Maine, since so large a proportion of its deaths occur at advanced ages.

C.-E. A. WINSLOW.

A DECADE OF PUBLIC CHARITY IN INDIANA.

The *Indiana Bulletin of Charities and Corrections* for the three months ending January 31, 1906 (March, 1906), issued by the Indiana Board of State Charities, offers a series of interesting summaries of Poor Relief in Indiana for the decade 1895–1905. Outlining the work of the State Board, which was organized in 1889, and referring to the various abuses existent prior to that date, an article on "A Decade of Outdoor Poor Relief in Indiana" (pp. 71–78) says:—

"That there was waste of money was shown conclusively by reports from county auditors. . . . It was learned that for the year ending May 31, 1890, relief by the township trustees amounted to $478,739.91 and the medical relief to $81,492.74, a total of $560,232.65. A portion of the medical relief was properly chargeable to the county institutions. Still, the figures indicated more than half a million dollars expended to relieve the poor not in institutions."

Other blanks had been sent to the trustees, but "only about one-third of the whole number of trustees returned the blanks, and of these less than one-half were intelligently filled, so that the effort to obtain statistics from that source was fruitless."

Reports from the auditors were received during the next five years, and in 1895 the cost of the year's relief by trustees was $630,168.79. "In all these years no statistics relating to the use of this great sum could be obtained other than the actual amounts paid out in the different counties. No method of accounting was in general use to show who received the money or why it was given, whether the money was being spent dishonestly or merely unwisely."

An act was passed that year to provide for this necessary information as to the expenditure by trustees: the resulting statistics were a revelation. The number reported as receiving relief was equal to one in every thirty-one of the State's inhabitants. The proportion in the various counties varied from one in thirteen to one in 208. In one township it was one in eight! Various acts subsequently passed have restricted opportunities for promiscuous expenditure of public moneys for poor relief. In 1899 a law limited the amount that a township trustee might give to any one family or person, without specific application to the County Commissioners, to $15, and the period of continued relief to three months. Many trustees erroneously interpreted this to mean that not more than $15 could be given at all in any quar-

ter or, in some cases, in a year. As a result of the act and of its misinterpretation, there was a surprising reduction in the amount given. "From $320,667.53 in 1899 it decreased to $209,956.22 in 1900. The number of persons reported as sharing in the relief decreased proportionally,—from 64,468 in 1899 to 43,369 in 1900." With a better realization of the meaning of the act there came a reaction. This law was changed in a codification of 1901: the three months' limit was removed, and the $15 limit was made to apply only to ordinary relief, exclusive of aid for sickness, burial, and school-books. The law is still in force, and is working satisfactorily.

The following summary of the economy effected in the decade is worth perpetuating:—

	1895.	1905.
Cost of relief to each inhabitant of the State	$0.29	$0.10
Highest per capita cost	.68	.29
Lowest per capita cost	.06	.03
Number of counties under $0.10 per capita cost	2	49
Number of counties over $0.30 per capita cost	35	0

A chart (p. 79) shows cost of relief from 1891 to 1905. As has been stated, relief given in 1895 amounted to $630,168. There is shown an almost unbroken decrease to $249,884 in 1905, the minimum being in 1899, $209,956. Statistics of the number aided in 1895 and 1896 are not trustworthy, but in 1897 82,235 people, or 3.2 per cent. of the population, were reported aided. In 1905 the number was 45,331, or 1.8 per cent.

Maps are presented (pp. 80–83) showing comparisons between 1895 and 1905 in the per capita cost of Outdoor Relief, by counties, and between 1897 and 1905 in the number aided, in proportion to the population, by counties. The latter comparisons are striking: in 1897 there was one person aided in each 30, in 38 counties, and one person in each 30 to 40, in 21 counties. In 1905 but one county gave aid to one-thirtieth of its population, and but 14 counties aided one in each 30 to 40 of its inhabitants.

Attention should be called to the pamphlet issued by the Indiana Board in October, 1905, "The Development of Public Charities in Indiana," summarizing the information given in the exhibit of the board at the Louisiana Purchase Exposition at St. Louis. It is one of the most encouraging and instructive documents on State Charities to be had at the present time. E. H. D.

THE CENSUS OF IOWA FOR THE YEAR 1905.

The Census of Iowa for the Year 1905. Executive document compiled by the Executive Council of the State of Iowa. A. H. Davison, Secretary of the Council; W. B. Martin, Secretary of State. 131 pp. of text, charts, and comparative tables and 908 pp. of general tables. Des Moines, Ia., 1905.

As early as the second day of January, 1906, there appeared in a single calf-bound volume of over one thousand pages the complete census returns of the State of Iowa for the year 1905. Iowa has an area of 56,025 square miles and a population of 2,210,050. The Executive Council, by whom the work was directed, should be highly commended for having completed this extensive census within a single year, particularly in view of the fact that published statistical reports are far too often obsolete when they leave the press.

In accordance with the new census law (Chapter VIII., Acts of the Thirtieth General Assembly of Iowa), the Executive Council prepared three schedules which were used in collecting returns for population, agriculture, and churches. The law provided that these schedules should be furnished to the county auditors, and by them to the township assessors before the first Monday in January, 1905, and that the returns should be forwarded to the Secretary of State not later than July 1 of the same year. It thus appears that the field work was done by the township assessors, under the immediate direction of the county auditors, who in turn were responsible to the Executive Council. It is not in the province of this review to discuss the merits of this arrangement, but the results appear to have been decidedly satisfactory.

The schedule for church returns was printed on return postal cards, which were mailed directly to the organizations from which returns were required.

The simplicity yet comprehensiveness of the three schedules used warrants their reproduction in this review.

(1)

Card No.....POPULATION SCHEDULE.
1905

County .....
Township .....
City.....Ward .....
Name .....
P. O. Address .....
Sex, Male—Female Can you read? { Yes. / No.
Can you write? { Yes. / No.
Color, White—Black—Yellow—Red. Age.....
Place of birth, Self .....
Place of birth, Mother .....
Place of birth, Father .....
Do you own your home or farm? { Yes. / No.
Entire value of home or farm? $.....
How much encumbrance on your home or farm? { $.....
If you are foreign born, are you naturalized? { Yes. / No.
Years in U.S. .....Years in Iowa .....
Conjugal condition { Single—Married—Widowed—Divorced—Separated.
Months in school in 1904. Public.....
High.....Private.....College.....
Occupation.....
Months unemployed in 1904.....
Military Service. { Service in Civil War—Mexican War—Spanish War.
Company.....Regiment.....State.....
Class of service { Cavalry—Infantry—Artillery—Navy.
Date of enlistment.....
Date of discharge .....
Remarks .....
Signed .....
Assessor.

(2)

Card No.....

AGRICULTURAL ROAD SCHEDULE.

County .....
Town or
Township .....
Name .....
P.O. Address.....
No. acres in farm.....
In what section located.....
Average distance to market.....miles.
Number bu. hauled to market per year:.....Corn .....Oats.....Wheat.....Barley .....other grains.....grass and other seeds .....Potatoes and other vegetables .....Fruits of all kinds
No. tons hay and other forage.....
No. loads fuel to market.....No. pounds live stock.....No. loads other produce.....
No. pounds milk or cream delivered to creamery per day.....For.....days each year.
Distance to creamery.....miles.
No. loads fuel, building material, etc., hauled from market per year.....
Average size of full loads hauled.....pounds.
Average time required for round trip, when hauling full loads.....hours.
No. trips to market per week without considerable load.....
Average distance travelled per week on highways other than to market.....miles.
Deposits of road material on farm:
Gravel { Yes. / No. Limestone { Yes. / No.
Remarks .....
Signed .....
Assessor.

(3)

CHURCH CENSUS SCHEDULE.

1. Name of organisation.....Location....
2. Nature of building in which services are held..
3. Value of church property (not including parsonage) .....
4. Value of Parsonage, if any.....
5. Seating capacity of church.....
6. Number of members or communicants.....
7. Number of Sunday-school scholars.....

Signed .....
Post-office Address .....

The first 131 pages of the report under review form an introduction prepared by Professor W. R. Patterson. This introduction opens with an historical sketch describing the acquisition of Iowa land from the Indians. An accompanying map presents in colors the outlines of the cessions from 1830 to 1851. By careful estimate it is shown in an extended table that the money value paid the various Indian tribes for the entire State of Iowa was less than three million dollars, or an average rate of less than eight cents per acre. Another table shows the disposition of Iowa land for public purposes; *i.e.*, to provide for an educational system and to aid in the construction of railways. Of the total donation of nearly eight million acres, almost one-half was given to the railroads.

The growth and spread of population in the State from 1838 to 1900 is the next topic considered. Maps showing the density of population by counties in 1840, 1850, and 1860, respectively, appear, and are of distinct interest. Several pages are devoted to a study of the "temporary decline in population" shown by this recent census as compared with that of 1900. It appears that there has been a decrease in population for the State as a whole, amounting to 21,800, or nearly one per cent., since 1900. No special reason for this "temporary decline" is assigned; but, after a careful study of the movement of population, Professor Patterson concludes that, while the so-called "urban population" has increased, the decrease in population in certain of the rural sections has more than counterbalanced the general increase in the more largely populated sections.

Other features of Professor Patterson's work consist of interpretative studies of the census returns and of the additional financial returns furnished by the heads of certain State departments and by various public institutions. The topics treated are manufactures, banking, fire insurance, life insurance, county tax receipts and disbursements, cities and towns, institutional expenditures, income from educational institutions, value and encumbrance of homes, railroad growth and development (1855–1905), and church membership and property. Inserted with these studies are charts showing the location of mineral areas of Iowa in 1904, the condition of banks (1873–1905), the growth of fire insurance (1871–1904) and of life insurance (1870–1904), the development of the railroad system (1855–70), and the railroad system as existing in 1880 and in 1904.

The bulk of the report consists of tabulated returns obtained on the schedules reproduced above, together with several tables relating to manufactures and considerable material classified as financial statistics. The compilation of these returns was under the immediate su-

pervision of Mr. A. H. Davison, the Secretary of the Council. In the preface to the report he is accredited by his associates in the Council with having performed his duties "with extraordinary economy and unusual accuracy."

In further commendation of the work it should be said that the appropriation "to enable the Executive Council to collect and compile the census of nineteen hundred and five, and to read the proof of the same," including, presumably, the additional features, but not the field work done by the township assessors, did not exceed fifteen thousand dollars,—an amount most economically expended in consideration of the numerous subjects covered by the returns.

ROSWELL F. PHELPS.

Report of the Massachusetts Commission on the Adult Blind, 1906. Pub. Doc. Boston, Mass. 32 pp.

This report marks the completion of the second stage in an investigation begun in 1903, and sums up the work of the commission having the matter in charge during the past three years. A résumé of what has been done in other States in the way of ameliorating the condition of the blind by means of education and industrial training forms a part of this report. The commission made a careful study of the statistics concerning the blind, contained in the Massachusetts censuses of 1895 and 1905 and the United States census of 1900, and has presented some instructive compilations in this report. A wide discrepancy, not fully explained by the commission, exists in the figures given from these two sources; but, in spite of this, it is apparent that there is a preponderance of adults among the blind. This is rendered significant when we are told that ample provision is made for the education and industrial training of children and youth, but that little has been done to aid the adult blind in those lines. Here are a large number of people, healthy and strong and willing to work, but, owing to lack of training, unable to perform any useful service. As the commission expresses it in summing up the matter, "The greatest need of the group appears to be not so much homes or health or friends as occupation."

C. W. DOTEN.

AMERICAN
STATISTICAL ASSOCIATION.

NEW SERIES, No. 75. SEPTEMBER, 1906.

DEATH-RATE OF THE UNITED STATES IN 1900.

By Walter F. Willcox.

The death-rate means the ratio of deaths to population, or, more specifically, the average number of persons dying in the course of a year to each thousand persons living in the middle of the year. It is found by multiplying the number of deaths which occurred in a given population during a year by one thousand, and dividing the product by the population enumerated or estimated as alive in the middle of that year. This definition shows that the accuracy of a death-rate, like that of any other ratio, depends upon the accuracy of the two elements, in this case the deaths and the population.

The main use of a death-rate is to measure the effective vitality and indicate the sanitary condition of a population. It constitutes the only trustworthy measure of public health. Neither general opinion nor the observation of expert physicians gives a basis for more than a crude and very inaccurate idea regarding the health of a community. Neither furnishes a safe basis for comparing one population with another at the same date, much less for determining whether the health of a population has advanced or declined within a given period of time. For this reason the public health

work of a country, state, or city, is largely dependent upon the accuracy and completeness of its work in vital statistics, and especially in mortality statistics.

The death-rate of an enormous and populous country like the United States is open to all the objections and qualifications which beset the use of similar averages in other fields. To say that the death-rate of the United States is about 16 is somewhat like saying that the average number of persons on a square mile in the United States is 26. But, if the average death-rate in 1890 was 18, and in 1900 16, this is a more important fact and a far more significant index of progress than the statement that the average density of population was about 21 in 1890 and 26 in 1900. In each case the general average is important as a standard from which to measure local deviations and temporal changes.

All this is elementary and well known. But the fact that no one knows the death-rate of the United States is also familiar, and in the light of that fact it might well be asked, what is the use of arguing that the information, if obtainable, would be of great value? The object of the present paper is to show that with the material presented by the Twelfth Census a closer approximation to the death-rate of the United States than has ever yet been made is possible, and by a lengthy and detailed computation to make that approximation. It may be well to begin with a brief review of previous efforts to ascertain the death-rate of the United States.

Work on the basis of which a death-rate for the United States might be computed began in 1850, when for the first time mortality schedules were provided on which was to be entered "the name of every person who died during the year ending June 1, 1850." The result of this inquiry was to get a record of 324,394 deaths as having occurred in the United States from June 1, 1849 to June 1, 1850. As the population enumerated on the later date was 23,191,876, this would give, without allowing for the increase of popula-

tion between December 1, 1849 and June 1, 1850, a death-rate of 13.9. But the census authorities commented on this death-rate in the following terms:—

The federal census of 1850 furnishes the first instance of an attempt to obtain the mortality during one year in all of the States of the Union, and had there been as much care observed in the execution of the law as was taken in framing it, and in the preparation of necessary blanks, a mass of information must have resulted relating to the sanitary condition of the country attained as yet in no other part of the world. This, however, would have been expecting too much. It was to take for granted, first, that the person interrogated in each family, whoever he might be, with regard to its affairs, would be able to recollect whatever death had occurred in it within the period of twelve months; and, second, to give the true designation of the cause of such death. One would think it not unreasonable that the facts of actual deaths would be striking and impressive enough in every household to be remembered for a much longer period than a single year, yet the returns of the marshals have only to be examined with care, and deductions made from them, to satisfy the most careless observer that in the Union at large at least one-fourth of the whole number of deaths have not been reported at all. Making allowance for even this error, the United States would appear to be one of the healthiest countries of which there is any record. The varying ratios between the States, as drawn from the returns, show not so much in favor of or against the health of either as they do, in all probability, a more or less perfect report of the marshals. Thus it is impossible to believe Mississippi a healthier State than Rhode Island, etc. For *rural* population the returns are no doubt nearer correct than they are for *urban*, and the old States are in general better reported than the new.

It may also be said in favor of the returns as published that they constitute but a beginning, and are not, perhaps, further from the truth than were the first attempts in States having registration systems. The same improvement as in these States may be expected hereafter. The publication of this volume will stimulate investigation and lead to a better understanding of the importance of the subject.

In regard to the number of *deaths* the returns of the census are not likely to deceive any one, since an attempt to reason from them would exhibit a degree of vitality and healthfulness in the United States unparalleled in the annals of any nation, and demonstrate between county and county and State and State the most extraordi-

nary differences in sanitary conditions. The truth is, but a part of the deaths have been recorded, varying for sections from a very small to a very large part of the whole.

In each of the following five censuses, those of 1860, 1870, 1880, 1890, and 1900, the same method was followed. The figures that resulted were used also for other purposes entirely foreign to the present discussion. Those which could be of any value in determining the death-rate of the United States are presented in the following table:—

Date.	Population.	Deaths.	Apparent death-rate per 1,000.
1850	23,191,876	323,023	13.9
1860	31,443,321	394,153	12.5
1870	38,558,371	492,263	12.8
1880	50,155,783	756,893	15.1
1890	62,622,250	875,521	14.0
1900	75,994,575	1,039,094	13.7

The general result of this method of ascertaining the total number of deaths occurring in the United States during the year preceding the census is to show that not more than about three-fifths have been reported. Accordingly, one may say with confidence that the true death-rate in every case was greater than the death-rate shown by the preceding table, but how much greater no one can tell.

In 1880, for the first time, an effort was made to determine the death-rate of what was known as the registration area, namely, that area in which the records of deaths made by State or municipal authority was much more complete than the record obtained by the enumerator's visits to the families. Under these circumstances the Census Office has felt warranted and, indeed, obliged to accept the local records, not as entirely faultless, but as far better than anything it could substitute for them through agencies of its own.

The following table shows for each of the last three censuses the population of continental United States, the population of the registration area, the per cent. of the former living in the latter, the deaths reported for the registration area, and the resulting death-rate.

Date.	Population of		Per Cent. of Population of United States in Registration Area.	Deaths in Registration Area.	Death-rate per 1,000.
	Continental United States.	Registration Area.			
1880 .	50,155,783	8,538,366	17.0	178,645	20.9
1890 .	62,622,250	19,659,440	31.4	386,212	19.6
1900 .	75,994,575	28,807,269	37.9	455,207	17.8

The preceding table shows that the proportion of the population of the United States having admissible local records of deaths increased in twenty years much faster than the population of the country, and included in 1900 three-eighths of that population, where in 1880 it included only one-sixth. In taking these figures as a basis for ascertaining the death-rate of the United States, two questions arise:—

1. How accurate are these death-rates for the registration area?

2. How far is the death-rate in the registration area an index to the death-rate of the entire United States at the same date?

These death-rates for the registration area are erroneous in that the population is that of the end rather than of the middle of the year, and in that omissions from the record are probably more numerous than duplications. Errors from the former source can be corrected by an estimate; those from the latter are uncertain in amount and beyond elimination. In the Twelfth Census, however, for the first time an effort was made to decrease this source of error by combining records from the two available sources, the

registration records and the enumerators' returns. The method which was followed being explained at length in the census volume dealing with this subject,* it is enough here to say that a reported death-rate of less than 15 for any large and normally constituted population is so small as to afford just ground for suspecting that the population is set at too large a figure or that the reported number of deaths is too small. When for this or any other reason the office desired to test the accuracy of the local returns, the enumerators were asked to fill the mortality schedules, and the lists thus secured were carefully compared with those reported from the registration office. As a result of this, 19,807 deaths were added to the 492,862 found on the registration record, or 3.9 per cent. of the entire number. But, perhaps, it is fairer to compare the additions with the deaths found on the registration record of those areas only from which both sources of information were available. From these areas 328,607 deaths were reported, 19,807, or 6.0 per cent., of which were added from the enumerators' returns. This effort has doubtless increased the accuracy and completeness of the record of deaths in the registration area, and, in consequence, the rate of 17.8 for 1900 may be deemed a closer approach to the truth than that of 19.6 for 1890 or 20.9 for 1880. This suggests that the true death-rate for the United States may have declined between 1880 and 1900 more rapidly than the apparent rate, but no such inference is warranted because the expansion of the registration area during the intervals invalidates any comparison.

The second question of the two just raised, namely, how far is the registration area representative or typical, and, in consequence, how far may one infer from its death-rate that of the whole country? calls for more detailed examination.

This question has been considered by the Census Office, as the following passages indicate:—

* Twelfth Census, vol. iii. pp. xi.–xxiv.

The death-rate in the non-registration area, including all the western and southern States, was certainly lower than it was in the registration area, partly because in the western States especially there was an unusual proportion of adults of the ages having a comparatively low death rate, while in the eastern States, which compose the registration area, there is a greater proportion of old people, who have a comparatively high mortality. *Eleventh Census* (1890), *Vital and Social Statistics*, Part I, page 11.

The death-rate for the United States can not be accurately determined, but as the registration area with its death-rate of 17.8 per 1,000 is very largely urban, and the non-registration area is almost wholly rural in character,it is probable that the death-rate in the latter more nearly approximates the death-rate in the rural part of the registration States (15.4 per 1,000). This would fix the general death-rate of the country somewhere between 15.4 and 17.8 per 1,000. If it be assumed that the death-rate in the rural part of the registration States fairly represents the rate in the rural part of the non-registration States, the general death-rate would be about 16.3 per 1,000. It probably did not vary much from this number. *Twelfth Census* (1900), volume iii, page lvii.

These quotations indicate that in 1890 the differences in age distribution alone, and in 1900 the differences in proportion of urban population alone, between the registration area and continental United States were in mind. No reference was made to the differences of the two populations in sex composition or in race composition, and no attempt was made to measure the amount of influence any or all of these differences exercised upon the figures. To do so is the object of the present paper.

Correction I for Sex only.

It is well known that there are in continental United States about 1,600,000 more males than females.* Figures for the registration area show that that part of the United States contains about 20,000 more females than males.† Or, speaking in relative terms, in each 10,000 persons in continental United States there were 5,108 males, in each

* Twelfth Census Abstract, p. 7. † Twelfth Census, vol. iii. p. xli.

10,000 persons in the registration area there were 4,997 males; that is, in 10,000 persons in continental United States there were 111 more males and 111 fewer females than in 10,000 persons in the registration area.

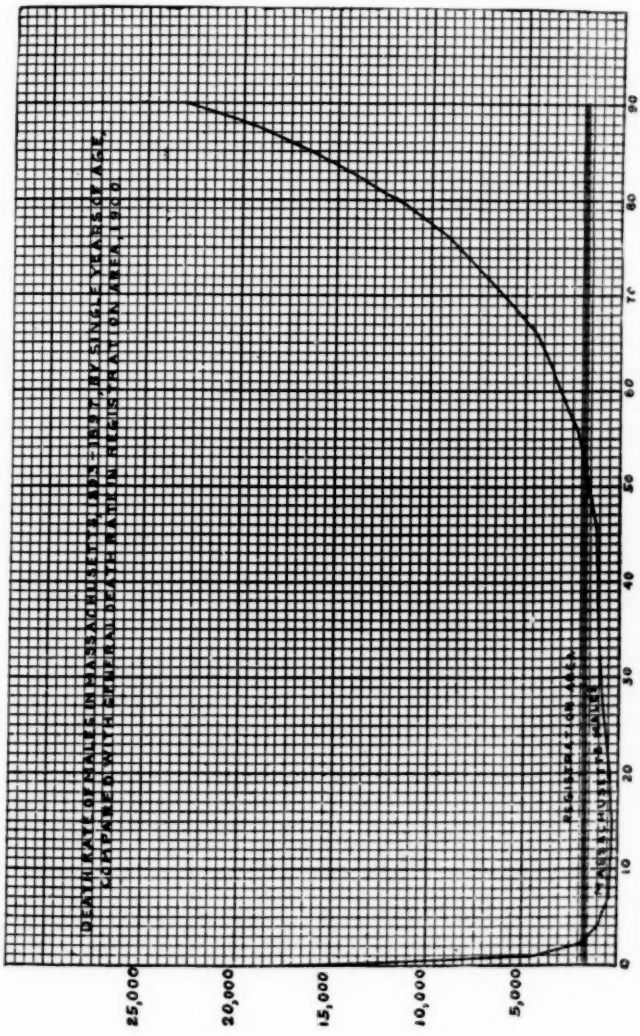
In this respect, then, the population of the registration area does not fairly represent the general population. As the death-rate of males in the registration area in 1900 was 18.95, and that of females was 16.64 per 1,000, that is, the death-rate of females was only about seven-eighths that of males, this difference between the proportions of the sexes in the registration area and the whole United States may affect the figures. A correction for it may be made by assuming that in continental United States the death-rate of each sex was the same as the death-rate of that sex in the registration area. On this assumption, if the male or female population of continental United States be multiplied by the death-rate of that sex in the registration area, and the sum of the two products divided by the total population, we obtain a corrected death-rate. The results are given in the following table:—

	Population of Continental United States.	Death-rate in Registration Area.	Computed Deaths in Continental United States.
Male	38,816,448	18.96	735,950
Female	37,178,127	16.64	618,650
Total	75,994,575	—	1,354,600

If the number of deaths thus computed be divided by the number of persons in continental United States, a death-rate of 17.82 per 1,000 results. This shows that, if persons of each sex in continental United States had the same death-rate as persons of that sex in the registration area, the total death-rate in continental United States would exceed that in the registration area by 0.02 per 1,000.

Correction II for Age only.

That the very young and the very old have a hold on life far weaker than that of persons in the prime of life is a fact of every-day observation which is confirmed and made precise by statistics. As we have no developed vital statistics for the United States, this fact can be best shown for Massachusetts. The following diagram indicates graphi-



cally the death-rate of males in Massachusetts for 1893 to 1897 at each year of age in comparison with the death-rate of the registration area of the United States for 1900, the horizontal line indicating the latter, and the curve the former.

The diagram shows that males in Massachusetts between three and fifty years of age have a lower death-rate than persons of all ages in the registration area. The data from which the diagram is derived show that the same is true of females in Massachusetts between three and fifty-three years of age. Hence a population with a large proportion of persons between three and fifty or fifty-three years old is likely to have for that reason a lower death-rate than a population with a small proportion of persons at those ages. This raises the question, how do the populations of the registration area and of continental United States compare in this respect?

In continental United States 9,159 persons out of 10,000 belong to the ages between three and forty-nine, inclusive. In the registration area the proportion is 8,971 in 10,000. This indicates that in continental United States the proportion of persons belonging to the healthy ages is nearly 2 per cent. greater than in the registration area, which would lead one to expect under like conditions of mortality at each age a lower total death-rate in continental United States than in the registration area. To determine whether this expectation is correct, and how great the difference from this cause is, the number of persons of each age in continental United States may be multiplied by the death-rate of that age in the registration area, and the sum of these products divided by the total population of continental United States, as in the following table:—

Age Period.	Population in Continental United States.	Death-rate in Registration Area.	Computed Deaths in Continental United States.
Under 1	1,916,892	165.43	317,111
1	1,768,078	46.64	82,463
2	1,830,332	20.48	37,485
3	1,824,312	13.18	24,044
4	1,831,014	9.36	17,138
5- 9	8,874,123	5.24	46,500
10-14	8,080,234	3.30	26,664
15-19	7,556,089	5.18	39,140
20-24	7,335,016	7.49	54,939
25-29	6,529,441	8.60	56,153
30-34	5,556,039	9.43	52,393
35-39	4,964,781	10.98	54,513
40-44	4,247,166	12.18	51,730
45-49	3,454,612	15.23	52,613
50-54	2,942,829	19.11	56,237
55-59	2,211,172	26.32	58,198
60-64	1,791,363	35.12	62,912
65-69	1,302,926	52.18	67,986
70-74	883,841	75.15	66,420
75-79	519,857	110.53	57,459
80-84	251,512	165.83	41,708
85-89	88,600	241.29	21,378
90-94	23,992	339.25	8,139
95 and over	9,770	418.89	4,092
Total known age	75,793,991	—	1,357,415
Computed death-rate	17.90	—	—

These figures fail to confirm the expectation indicated in the quotation from the census of 1890, and supported by our own provisional conclusion, that, when a correction is introduced for age only, it would lower the death-rate. To ascertain, if possible, the reason for this, the number of persons of each age to 100,000 persons of known age has been computed for continental United States, and the registration area and the excess in one area or the other at each age indicated in the following table:—

Age Period.	Number of Persons in Each 100,000 of Known Ag in Continental United States.	Number of Persons in Each 100,000 of Known Age in Registration Area.	Excess in Continental United States.	Excess in Registration Area.
Under 1	2,529	2,150	379	—
1	2,332	1,939	393	—
2	2,414	2,042	372	—
3	2,406	2,066	340	—
4	2,415	2,052	363	—
5- 9	11,708	9,988	1,720	—
10–14	10,660	9,058	1,602	—
15–19	9,969	9,022	947	—
20–24	9,677	9,932	—	255
25–29	8,614	9,692	—	1,078
30–34	7,330	8,559	—	1,229
35–39	6,550	7,712	—	1,162
40–44	5,603	6,369	—	766
45–49	4,557	5,009	—	452
50–54	3,882	4,210	—	328
55–59	2,917	3,188	—	271
60–64	2,363	2,592	—	229
65–69	1,719	1,852	—	133
70–74	1,166	1,268	—	102
75–79	685	753	—	68
80–84	331	365	—	34
85–89	116	129	—	13
90–94	31	32	—	1
95 and over	12	9	3	—

The preceding table shows that in each 100,000 persons in continental United States there were 1,144 more children under three years of age than there were in each 100,000 persons in the registration area. Reference to the preceding diagram, or table, shows how very much the death-rate in those three years, and especially at the first two, exceeds the death-rate at all ages. Clearly, the larger proportion of children in continental United States, a difference overlooked in previous discussions of this question, more than neutralizes the larger proportion of persons of healthy ages as a whole in continental United States.

We may conclude with confidence that, if persons of each age in continental United States had the same death-rate as persons of that age in the registration area, the total death-rate in continental United States would exceed that in the registration area by 0.10 per 1,000.

Correction III for Age and Sex.

"As the correction for sex increases the death-rate 0.02 per 1,000 and for age 0.10 per 1,000, it might be thought that the two combined would increase the death-rate 0.02 + 0.10, or 0.12 per 1,000. But the true way to make a correction for the two in combination is to multiply the population in continental United States of each sex and age by the death-rate in the registration area of corresponding sex and age, and divide the sum of the deaths thus computed by the population of known age in continental United States. The results of this process appear in the following table:—

Age Period.	Population in Continental United States.		Death-rate in Registration Area.		Computed Deaths in Continental United States.	
	Male.	Female.	Male.	Female.	Male.	Female.
Under 1	969,257	947,635	183.69	146.84	178,042	139,150
1	893,263	874,815	49.08	44.16	43,841	38,631
2	925,260	905,072	21.26	19.69	19,671	17,820
3	920,335	903,977	13.31	13.05	12,249	11,796
4	925,497	905,517	9.33	9.39	8,634	8,502
5 - 9	4,479,396	4,394,727	5.36	5.13	24,009	22,544
10-14	4,083,041	3,997,193	3.35	3.25	13,678	12,990
15-19	3,750,451	3,805,638	5.34	5.03	20,027	19,142
20-24	3,624,580	3,710,436	7.99	7.03	28,960	26,084
25-29	3,323,543	3,205,898	9.02	8.19	29,978	26,256
30-34	2,901,321	2,654,718	9.94	8.89	28,839	23,600
35-39	2,616,865	2,347,916	11.78	10.12	30,826	23,760
40-44	2,255,916	1,991,250	13.19	11.07	29,755	22,043
45-49	1,837,836	1,616,776	16.86	13.50	30,985	21,826
50-54	1,564,622	1,378,207	21.12	17.03	33,044	23,470
55-59	1,145,257	1,065,915	28.95	23.71	33,155	25,272
60-64	917,167	874,196	38.11	32.30	34,953	28,236
65-69	667,669	635,257	56.57	48.14	37,770	30,581
70-74	449,609	434,232	80.54	70.22	36,211	30,491
75-79	261,579	258,278	118.34	103.59	30,955	26,755
80-84	122,273	129,239	177.24	156.52	21,671	20,228
85-89	40,742	47,858	259.04	228.53	10,553	10,936
90-94	9,858	14,134	355.35	330.14	3,503	4,666
95 and over	3,688	6,082	427.91	414.44	1,578	2,520
Total known age	38,689,025	37,104,966	—	—	742,887	617,299

Total population	75,793,991
Total deaths	1,360,186
Computed death-rate	17.94

This table shows that, if persons of each age and sex in continental United States had the same death-rate as persons of that age and sex in the registration area the total death-rate in continental United States would exceed that in the registration area by 0.14 per 1,000.

Correction IV for Race only.

In continental United States 87.91 per cent. of the population are white, and 12.09 are colored. In the registration area 95.66 per cent. are white, and 4.34 per cent. are colored. It is clear that in this respect the population of the registration area is far from representative. The difference is the more important because of the wide difference between the death-rates of the two races.

A correction for race only may be made by computing the death-rates of the two races separately for the registration area, and multiplying the white population and the colored population, respectively, of continental United States by the rates thus found. The death-rate of whites in the registration area was 17.26 per 1,000; that of the colored was 29.59 per 1,000. The results of this correction are shown in the following table:—

	Population of Continental United States.	Death-rate in Registration Area per 100,000.	Computed Deaths in Continental United States.
White	66,809,196	1,726.1	1,153,194
Colored	9,185,379	2,958.8	271,777
Total	75,994,575	—	1,424,971

Dividing the above number of computed deaths by the total population of continental United States, a death-rate of 18.75 is reached. This shows that, if persons of each race in continental United States had the same death-rate as

persons of that race in the registration area, the total death-rate in continental United States would exceed that in the registration area by 0.95 per 1,000.

Correction V for Race and Sex.

The same method may be applied to a correction for race and sex in combination. The results are indicated in the following computation:—

	Population in Continental United States.	Death-rate in Registration Area per 1,000.	Computed Deaths in Continental United States.
White:			
Male	34,201,735	18.40	629,312
Female	32,607,461	16.12	525,632
Colored:			
Male	4,614,713	31.42	144,994
Female	4,570,666	27.82	127,156
Total	75,994,575	—	1,427,094

If the number of deaths thus computed be divided by the number of persons in continental United States, a death-rate of 18.78 results. This shows that, if persons of each race and sex in continental United States had the same death-rate as persons of that race and sex in the registration area, the total death-rate in continental United States would exceed that in the registration area by 0.98 per 1,000.

Correction VI for Race and Age.

It has already appeared that correction for age only raises the death-rate of continental United States by 0.10 per 1,000, and for race only by 0.95 per 1,000, but that it is inadmissible to take the sum of these two corrections as the true correction for race and age combined. A trustworthy result can

be reached only by multiplying the population in continental United States of each race and age by the death-rate in the registration area of the same race and age, and dividing the sum of the deaths thus computed by the total population of continental United States of known age. This is done in the following table:—

Age Period.	Population in Continental United States.		Death-rate in Registration Area.		Computed Deaths in Continental United States.	
	White.	Colored.	White.	Colored.	White.	Colored.
Under 1	1,665,007	251,885	158.03	371.46	263,121	93,565
1	1,529,181	238,897	44.13	117.11	67,482	27,977
2	1,574,382	255,950	19.41	49.37	30,558	12,636
3	1,573,460	250,852	12.69	26.89	19,967	6,745
4	1,577,922	253,092	9.05	17.88	14,280	4,525
5–9	7,638,326	1,235,797	5.05	10.40	38,573	12,852
10–14	6,959,238	1,120,996	3.06	9.10	21,295	10,201
15–19	6,543,189	1,012,900	4.75	14.13	31,080	14,312
20–24	6,335,044	999,972	6.94	16.69	43,965	16,689
25–29	5,762,980	766,461	8.13	16.79	46,853	12,868
30–34	5,004,444	551,595	9.06	17.04	45,340	9,399
35–39	4,460,575	504,206	10.56	19.18	47,103	9,670
40–44	3,852,143	395,023	11.64	23.35	44,838	9,223
45–49	3,105,678	348,934	14.63	28.05	45,436	9,787
50–54	2,633,981	308,848	18.45	34.15	48,596	10,547
55–59	2,021,217	189,955	25.68	44.54	51,904	8,460
60–64	1,620,658	170,705	34.46	55.99	55,847	9,557
65–69	1,195,295	107,631	51.60	73.45	61,677	7,905
70–74	808,097	75,744	74.62	95.51	60,300	7,234
75–79	477,720	42,137	110.21	124.03	52,649	5,226
80–84	224,717	26,795	165.88	164.03	37,276	4,395
85–89	78,027	10,573	242.82	201.45	18,946	2,129
90–94	18,319	5,673	342.85	283.22	6,280	1,606
95 and over	4,544	5,226	431.64	368.91	1,961	1,927
Total known age	66,664,144	9,129,847	—	—	1,155,327	309,435

Total population	75,793,991
Total deaths	1,464,762
Computed death-rate	19.32

The preceding table shows that, if persons of each race and age in continental United States had the same death-rate as persons of that race and age in the registration area,

the total death-rate in continental United States would exceed that in the registration area by 1.52 per 1,000.

Correction VII for Race, Sex, and Age.

The method already used in correcting for age and sex, race and sex, and race and age, may be extended to this more complicated field. In the following table the number of persons of each race, sex, and age in continental United States has been multiplied by the death-rate of the corresponding race, sex, and age in the registration area.

The table on the following page shows that, if persons of each race, sex, and age in continental United States had the same death-rate as persons of that race, sex, and age in the registration area, the total death-rate in continental United States would exceed that in the registration area by 1.57 per thousand.

Correction VIII for the Middle of the Year.

The fact that all the death-rates for the registration area have been computed by using as a divisor the population enumerated at the end of the year rather than that estimated at the middle of the year has already been mentioned. The correction due to this source, in combination with the corrections due to sex, age, and race, may be roughly estimated by reducing the final divisor in the preceding table to 75,342,232, the estimated population of continental United States December 1, 1899. This results in a death-rate of 19.49 and shows that, if correction be made for sex, age, race and the middle of the year, the total death-rate in continental United States would exceed that in the registration area by 1.69 per thousand.

Each of the corrections thus far introduced has resulted in raising the probable death-rate of continental United States above that of the registration area. With the ma-

Age Period.	Population in Continental United States.				Death-rate in Registration Area.				Computed Deaths in Continental United States.			
	White.		Colored.		White.		Colored.		White.		Colored.	
	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.	Male.	Female.
Under 1	844,238	820,769	125,019	126,866	175.94	139.78	403.87	339.69	148,535	114,727	50,491	43,095
1	774,700	754,481	118,563	120,334	46.44	41.79	126.02	108.63	35,977	31,529	14,941	13,071
2	797,349	777,033	127,911	128,039	20.17	18.64	51.54	47.28	16,082	14,483	6,592	6,053
3	796,172	777,288	124,163	126,689	12.86	12.53	26.38	27.39	10,238	9,739	3,275	3,470
4	798,996	778,926	126,501	126,591	9.08	9.03	16.23	19.52	7,254	7,033	2,053	2,471
5–9	3,862,349	3,775,977	617,047	618,750	5.19	4.91	9.92	10.85	20,045	18,540	6,121	6,713
10–14	3,519,303	3,439,935	563,738	557,258	3.15	2.98	8.52	9.62	11,085	10,251	4,803	5,360
15–19	3,258,090	3,285,099	492,361	520,539	4.96	4.56	14.05	14.19	16,160	14,980	6,917	7,386
20–24	3,145,481	3,189,563	479,099	520,873	7.36	6.56	19.43	14.48	23,150	20,923	9,308	7,542
25–29	2,942,882	2,820,098	380,661	385,800	8.52	7.76	18.00	15.65	25,073	21,883	6,851	6,037
30–34	2,619,446	2,384,998	281,875	269,720	9.51	8.58	18.50	15.44	24,910	20,463	5,214	4,164
35–39	2,360,348	2,100,227	256,517	247,689	11.35	9.71	20.01	18.25	26,789	20,393	5,132	4,520
40–44	2,055,176	1,796,967	200,740	194,283	12.68	10.51	23.36	23.35	26,059	18,886	4,689	4,536
45–49	1,651,972	1,453,706	185,864	163,070	16.25	12.93	29.68	26.19	26,844	18,796	5,516	4,270
50–54	1,396,035	1,237,946	168,587	140,261	20.42	16.42	36.58	31.44	28,507	20,327	6,166	4,409
55–59	1,040,235	980,982	105,022	84,933	28.29	23.11	47.15	41.70	29,428	22,670	4,951	3,541
60–64	825,213	795,445	91,954	78,751	37.45	31.62	58.80	53.36	30,904	25,151	5,406	4,202
65–69	608,715	586,580	58,954	48,677	55.93	47.62	80.67	67.02	34,045	27,932	4,755	3,262
70–74	411,658	396,439	37,951	37,793	79.81	69.85	111.93	83.32	32,854	27,691	4,247	3,148
75–79	240,284	237,436	21,295	20,842	117.80	103.42	144.96	109.74	28,305	24,555	3,086	2,287
80–84	110,087	114,630	12,186	14,609	176.51	157.11	208.33	139.57	19,431	18,009	2,538	2,038
85–89	35,838	42,189	4,904	5,669	260.03	230.33	228.92	185.94	9,318	9,717	1,122	1,054
90–94	7,607	10,712	2,251	3,422	355.30	335.64	356.25	254.85	2,702	3,595	801	872
95 and over	1,735	2,809	1,953	3,273	420.47	437.55	465.28	333.33	729	1,229	908	1,090
Total known age	34,103,909	32,560,235	4,585,116	4,544,731	—	—	—	—	634,424	523,502	165,883	144,591

Total population	75,793,991
Total deaths	1,468,400
Total death-rate	19.37

terial in hand, no further corrections can be ventured. Undoubtedly, the two differences between the population of continental United States and the population of the registration area most significant for the death-rate are the larger proportion of negroes in continental United States and the larger proportion of urban population in the registration area. Negroes have a higher death-rate than whites; city dwellers, a higher death-rate than country dwellers. These two differences would tend thus to offset each other. A correction for the race difference has been made. But every effort to introduce a correction for the difference in the proportion of city dwellers has been baffled by the fact that there is in the United States no large and representative body of rural population wherein deaths are reported with sufficient completeness and accuracy to make the resultant death-rates significant.

The net result of this inquiry is thus to show that the effect of every correction which can be made with any approach to accuracy is to raise the death-rate of continental United States above that of the registration area, and to fix a maximum limit of 19.5 per 1,000 for the death-rate of continental United States in 1900. Perhaps the writer may venture to express it as his personal opinion, although not susceptible of demonstration, that the minimum limit can not be lower than the death-rate in the registration area, namely, 17.8 per 1,000.

METHODS OF DEALING WITH BIRTH-RATE STATISTICS.

EDITED BY CARROLL W. DOTEN.

While the question of a declining birth-rate, or, as it is usually expressed in newspaper discussion, "race suicide," has been somewhat overshadowed of late by railway rate regulation, insurance investigations, and the exposures of scandalous practices in many lines in the United States, it seems to have awakened renewed interest in the mother country. In a sense this is only one aspect of the keener appreciation and deeper study of general social problems and vital statistics which have been characteristic of English thought in recent years. Evidences of degeneracy in certain classes of the population were disclosed during the Boer War. England's commercial and financial leadership is no longer so supreme and impregnable as it once appeared to be. These and other causes have led to a sort of national introspection,—results of which are becoming manifest in many ways. This renewed interest in the birth-rate appears to the writer to be one phase of the self-examining process to which the nation is subjecting itself; but, whether it is so in fact or not, it seems worth while to call the attention of the readers of these publications and the members of this Association to some new methods which have been employed in investigations reported during the past year. Moreover, the results arrived at should awaken interest here, as they have in England, where an active newspaper discussion is at present being carried on with men like Karl Pearson and Sidney Webb as contributors.

The point of departure of this new interest and popular discussion was two excellent papers read before the Royal

Statistical Society at its meeting on Dec. 19, 1905, and published in full in its Journal, Vol. LXIX, Part 1, March 31, 1906. These papers were "The Decline of Human Fertility in the United Kingdom and Other Countries as shown by Corrected Birth-rates," by Arthur Newsholme, M.D., medical officer of health of Brighton, and T. H. C. Stevenson, M.D., assistant medical officer to the Education Committee of the London County Council; and "On the Changes in the Marriage and Birth-rates in England and Wales during the Past Half-century, with an Inquiry as to their Probable Causes," by G. Udny Yule, Newmarch Lecturer in Statistics, University College, London.

No mere review or summary could do justice to these papers. Therefore, it seems best to extract considerable portions of them for this publication.

The authors of the first paper explain the purpose of their investigation, and justify the calculation of a refined birth-rate, as follows:—

> In dealing with birth statistics, one or other of two objects may be desired: to ascertain the rate of natural increase of a community, or to determine its fertility. The first object is achieved by deducting the crude death-rate from the birth-rate as ordinarily stated. The statistics thus obtained are of great importance as indicating the results of the natural forces at work. But they deal with results only, and if the forces themselves are to be made the subject of inquiry, a rearrangement of the facts and their statement in different terms from those of the crude birth- and death-rates are necessary. The corrected rate measures a force, the crude rate the result of the operation of this force. Thus in the case of death-rates the inherent tendency to mortality is measured, not by the crude, but by the corrected death-rate, the crude death-rate stating the result of the tendency to death acting upon a population of given age and sex constitution. The Registrar-General's reports have accustomed us to the distinction for death-rates, and we should not think of using crude death-rates in an index of mortality in this sense. But for birth-rates it is otherwise. The birth-rate as ordinarily stated, which will be referred to henceforward as the crude birth-rate, is still generally employed as the measure of the

tendency of a population to increase by natural means, no other measure being in most cases readily available. That such use is often entirely misleading will be abundantly proved by numerous specific instances in the course of this paper.

If a clue as to the future and an explanation of past experience is required, a method of stating the birth-rate analogous to that by which corrected death-rates are obtained is necessary. Such a birth-rate should be an accurate measure of the tendency of the community to increase, just as the corrected death-rate forms an accurate statement of its tendency to decrease. In other words, the corrected birth-rate must be a measure of fertility, which operating upon a population of given constitution as to age, sex and marriage, produces as its result the crude birth-rate.

In this paper we propose, first, to refer briefly to the method already described elsewhere by us which we have adopted for obtaining corrected birth-rates; secondly, to give exact birth-statistics for the different parts of the United Kingdom and for other countries in which all causes of non-comparability of data due to different ages at marriage and to number of wives at child-bearing ages shall have been eliminated; and, thirdly, to ascertain by a comparison of recent experience with that of twenty to twenty-two years earlier, the changes in fertility which have occurred, and the extent and distribution of these changes in different countries.

Method of Calculating Corrected Birth-rate.

Many years ago Dr. Farr stated the legitimate birth-rate in proportion to the number of married women aged 15–45 as comprising nearly all the child-bearing years, and in the annual report of the Registrar-General for 1903 this method is again adopted, and the statement is made that—

"The disturbing factor of changing constitution of the population is mainly, though not entirely, eliminated by calculating the proportion of births to the number of women living at child-bearing ages. This method of measuring the birth-rate shows the amount of the decrease to be far greater than is shown by the rates based on the total population."

The above method fails, however, to make allowance for the varying fertility of wives at different ages. The magnitude of these differences is shown by the following table, compiled by Körösi:—

TABLE A.—Number of Births per Annum per 1,000 Wives at each Age-period.

Age of Mother.	Edinburgh and Glasgow, 1855.	Alsace-Lorraine, 1872.	Norway, 1874–76.	Finland, 1880–81.
15–20	500	465	413	379
20–25	418	563	579	406
25–30	346	463	430	357
30–35	266	388	360	322
35–40	204	282	300	261
40–45	80	—	181	158
45–50	13	—	33	27
50–55	—	—	—	—

Age of Mother.	Brunswick, 1880–81.	Denmark, 1880–89.	Berlin, 1887–90.	Buda-Pest, 1889–92.	Sweden, 1891.
15–20	581	715	503	428	518
20–25	454	494	456	358	451
25–30	347	405	336	292	375
30–35	268	312	225	206	312
35–40	198	230	145	147	250
40–45	81	114	60	59	142
45–50	11	13	7	7	20
50–55	—	—	0.2	0.7	—

The general law of decline of fertility with advancing age is clearly shown in each of the above communities.

In the following table the same facts are set out in another manner, which enables the relative fertility at different ages in each community to be more easily appreciated. This table cannot, of course, be employed to compare the fertility in different communities.

TABLE B.—Relative Fertility-rates of Married Women, the Fertility-rate for the Age-period 20–25 being taken as 100.

[The actual fertility-rate per 1,000 married women aged 20–25 is given in parentheses for each community.]

Age of Mother.	Edinburgh and Glasgow	Alsace-Lorraine.	Norway.	Finland.	Brunswick.
15–20	120	83	71	94	128
20–25	100	100	100	100	100
	(418)	(563)	(579)	(406)	(454)
25–30	83	82	74	88	76
30–35	64	69	62	79	59
35–40	49	50	52	65	44
40–45	19	—	31	39	18
45–50	3	—	6	7	2

Age of Mother.	Denmark.	Berlin.	Buda-Pest.	Sweden.	Average exclusive of Berlin and Buda-Pest.
15–20	145	111	120	115	108
20–25	100 (494)	100 (456)	100 (358)	100 (451)	100
25–30	82	74	82	83	81
30–35	63	50	58	69	66
35–40	47	32	41	56	52
40–45	23	13	17	32	27
45–50	3	2	2	4	4

Figures like the above, if available for every community year by year, would give an exact determination of fertility. This is evident from Tables A and B, and a further example is given in Table C, in which, Sweden being taken as a standard, the course of events in New South Wales can be determined.

TABLE C.—Legitimate Fertility-rate of New South Wales compared with that of Sweden, 1891, the Fertility-rate at each Age-period in Sweden being stated as 100.*

Age of Mother.	Sweden, 1891.		New South Wales. Proportional Figures.			
	Birth-rate per 1,000 Wives at each Age.	Proportional Figures.	1871.	1881.	1891.	1901.
15–20	518	100	87	89	83	97
20–25	451	100	98	102	93	88
25–30	375	100	109	108	95	80
30–35	312	100	108	109	94	73
35–40	250	100	108	110	94	69
40–45	142	100	95	91	83	62

Such figures are, however, only available in a few communities. In the United Kingdom our birth-returns unfortunately do not comprise a statement of the age of the father and the mother, of the duration of marriage and of preceding births, which are essential to complete birth-statistics. . . .

But even were the additional data indicated above available, the method of comparing fertility-rates at ages 20–25, 25–30, &c., il-

* The figures for New South Wales are calculated from a table given on p. 7 of "Report of Royal Commission on the Decline of the Birth-rate, etc., in New South Wales," vol. i, 1904.

lustrated in Table A, would be cumbrous and difficult, and would render a view *toute ensemble* almost impracticable. Furthermore, it would involve an elaborate annual recalculation, instead of the calculation of a factor of correction holding good for an entire intercensal period. It is necessary, in short, to have corrected birth-rates, correcting not only for differences of age and sex constitution, as the Annual Summaries of the Registrar-General do for death-rates, but also for differences of marital condition.

We have described a method by which these corrections can be made. Standard fertility-rates, those of Sweden in 1891 being adopted in this paper, are applied to the wives of the community whose true birth-rate is to be ascertained, and the births at each age-period 15–20, 20–25, 25–30, 30–35, 35–40, and 40–45, which according to this standard ought to occur, are thus ascertained. Thus, in Berkshire in 1901, according to the Swedish standard, 8,510 births should have occurred in its population of 283,531, and its standard birth-rate is, therefore, 30.01. The standard* birth-rate of England and Wales in 1901, similarly calculated, is 34.91, and this is employed throughout the present paper as the standard with which other birth-rates are compared. By this means the exact position of England and Wales in relation to fertility can at once be seen, when comparing it with its past experience, with the experience of its constituent parts, with that of the rest of the British Empire, and of other countries. The factor of correction stating the birth-rate of Berkshire in relation to that of England and Wales $= \frac{34.91}{30.01} = 1.1633$. The legitimate birth-rate of Berkshire recorded in the Registrar-General's report for 1903 being 23.04, its corrected birth-rate becomes $23.04 \times 1.1633 = 26.80$.

The standard birth-rate takes into account both the ages and the number of the wives, and the resulting factor therefore corrects for both. By calculating and applying such factors of correction to the recorded or crude birth-rates of the communities dealt with, birth-rates exactly comparable with each other are obtained, which give the true fertility of each population, after all considerations as to the varying number and varying ages of the wives in each population have been eliminated.

... It is evident that these birth-rates will vary with three conditions: (1) The proportion of women aged 15–45 in the given population; (2) the proportion of these women who are married; and (3), to a less extent, the ages of these married women. For the present

* When not otherwise indicated, "birth-rate" throughout this paper signifies legitimate birth-rate.

we omit the consideration of the illegitimate birth-rate, as in regard to illegitimacy it is not, in the main, a problem of fertility. . . .

The above-mentioned method of correction does not eliminate any differences of fertility which may be caused by differences in the duration of marriage before the birth of each child. In England we have no data on this point, and no correction for this source of variation can be made. Were it otherwise, the discrepant experience in the communities, *e.g.*, Budapest and New South Wales, for which the information is available, would leave one in doubt as to whether it is justifiable to use any factor of correction on this account.

TABLE D.—Budapest.* Number of Children Born Annually to 100 Wives at each Age-period.

	Age of Wives.					
	15–20.	20–25.	25–30.	30–35.	35–40.	40–45.
Wives in the first year of marriage:	20.4	26.7	30.9	32.9	32.7	20.4
All wives	42.8	35.8	29.2	20.6	14.7	5.9

TABLE E.—New South Wales.† Number of Children born annually to 100 Wives at each Age during the Ten Years 1891–1900.
(*Intermediate Ages are Omitted.*)

	Age at Marriage.					
	20.	25.	30.	35.	40.	45.
Wives in the first year of marriage	39.7	36.2	25.6	14.4	5.8	—
Wives with previous issue	—	29.0	27.4	23.4	15.5	3.5

The fertility of the newly-married wives in Budapest is much lower than that of all wives at ages under 25, about equal to that of all wives 25–30, and higher at ages over 30. In New South Wales the fertility of newly-married women is higher than that of women with previous issue up to the age of 27, after which age it is lower, at first slightly lower, but at the age of 35 and upwards considerably lower.

* Körösi, "Philosophical Transactions, Royal Society," vol. 186 (1895) B., p. 808.

† T. A. Coghlan, Essay on the "Decline in the Birth-rate of New South Wales," p. 33 (1903).

The conditions in the two populations are in fact inverted, and it is clear that, if the experience of New South Wales were taken as a standard, any proposed correction of birth-rate for duration of marriage would be in the opposite direction to a correction based on the experience of Budapest.*

If some other standard fertility-rates than those of Sweden had been chosen, would the factors of correction have been materially different? . . . . This has been tested somewhat elaborately by applying the fertility-rates given in Table A to test populations, as shown in Table F.

It will be seen that most of the corrected birth-rates in Table F, calculated on whatever basis, are remarkably close to each other, although the instances in this table were—excepting Essex, which was taken at random—specially selected, as likely to show the widest divergencies capable of being found, owing to unusual constitution of population, both as to age and married condition. Thus Glamorgan was selected because it has the highest proportion of its potential mothers married of any county; Scotland N., because it has the lowest proportion of wives of any of the divisions of Great Britain; Paris, because its birth-rate is not much more than one-third of what it should be on the Swedish basis.

When calculated by applying four sets of fertility-rates, the corrected birth-rates for the county of Essex only differ in the second place of decimals; those of Sydney, only between 21.57 and 21.65; of Paris, between 11.87 and 12.04; of Glamorgan, between 30.94 and 30.43. The corrected birth-rate of Scotland N., when calculated by applying eight different sets of fertility-rates, varies between 33.62 and 35.88; but this is a most exceptional and abnormally constituted population.

* M. Cauderlier has proposed a system of weighting birth statistics according to the duration of marriage. Thus, if the factor of correction for marriages of less than three years' duration be 1, it will be 0.66 in France and 0.8 in other countries for marriages of three to six years' duration, 0.33 in France, and 0.6 in other countries for marriages of six to nine years' duration, and so on. M. Lucien March, from whose paper in the Transactions of the International Congress of Hygiene and Demography at Brussels in 1903 the preceding statement is derived, gives the following coefficients for Austria:—

DURATION OF MARRIAGE.

	Years						
	0-3	3-6.	6-9.	9-12.	12-15.	15-18.	18-21.
Weight	1	0.86	0.72	0.58	0.44	0.30	0.16

TABLE F.—Comparison of Fertility-rates for Wives aged 15–45 by the Application of Various Sets of Rates to Certain Populations.

1 Population.	2 Fertility-rates forming Basis of Correction.	3 Standard Legitimate Birth-rate based on the Experience of Wives aged 15–45.	4 Factor of Correction based on 3.	5 Crude Legitimate Birth-rate.	6 Corrected Legitimate Birth-rate based on 4.	7 Standard Birth-rate based on the Experience of Wives aged 15–50.	8 Factor of Correction based on 7.	9 Legitimate Birth-rate corrected by the Factor 8.
England and Wales, 1901	Sweden, 1891	34.91	1	—	—	35.27	—	—
	Finland, 1880–81	34.62	1	—	—	35.11	—	—
	Norway, 1874–76	41.55	1	—	—	42.15	—	—
	Denmark, 1880–89	35.33	1	—	—	35.57	—	—
	Brunswick, 1880–81	30.35	1	—	—	30.55	—	—
	Edinburgh and Glasgow, 1855	29.84	1	—	—	30.08	—	—
	Berlin, 1887–90	26.99	1	—	—	27.12	—	—
	Budapest, 1889–92	23.91	1	—	—	24.04	—	—
Essex registration county, 1901	Sweden, 1891	36.91	0.9458	29.42	27.83	37.27	0.9463	27.84
	Norway	43.92	0.9460	29.42	27.83	44.51	0.9470	27.86
	Edinburgh and Glasgow	31.55	0.9458	29.42	27.83	31.78	0.9465	27.85
	Budapest	25.26	0.9466	29.42	27.85	25.39	0.9468	27.85
Sydney, 1901	Sweden	36.31	0.9614	22.45	21.58	—	—	—
	Norway	43.08	0.9645	22.45	21.65	—	—	—
	Edinburgh and Glasgow	31.05	0.9610	22.45	21.57	—	—	—
	Budapest	24.87	0.9614	22.45	21.58	—	—	—
Paris, 1901	Sweden	44.26	0.7887	15.19	11.98	—	—	—
	Norway	52.44	0.7923	15.19	12.04	—	—	—
	Edinburgh and Glasgow	38.03	0.7846	15.19	11.92	—	—	—
	Budapest	30.59	0.7816	15.19	11.87	—	—	—
Scotland N., 1901	Sweden	20.04	1.7420	19.57	34.09	20.37	1.7315	33.89
	Finland	20.15	1.7181	19.57	33.62	20.49	1.7135	33.53
	Norway	23.88	1.7399	19.57	34.65	24.42	1.7260	33.78
	Denmark	19.90	1.7754	19.57	34.74	20.11	1.7688	34.62
	Brunswick	16.94	1.7916	19.57	35.06	17.12	1.7845	34.92
	Edinburgh and Glasgow	16.75	1.7815	19.57	34.86	16.96	1.7736	34.71
	Berlin	14.72	1.8336	19.57	35.88	14.83	1.8287	35.79
	Budapest	13.29	1.7991	19.57	35.21	13.40	1.7910	35.05
Glamorgan, 1901	Sweden	38.78	0.9002	34.31	30.89	39.11	0.9018	30.94
	Norway	46.08	0.9017	34.31	30.94	—	—	—
	Edinburgh and Glasgow	33.46	0.8918	34.31	30.60	—	—	—
	Budapest	26.96	0.8869	34.31	30.43	—	—	—

The validity of the Swedish fertility-rates has been further tested by means of the figures in the last column in Table B, in which the rates for Berlin or Buda-Pest are not included, on account of their obviously artificial nature. All the other sets of fertility-rates in the table were compared, age by age, with the average, and the divergencies by way of excess or deficiency added together for each set. When this was done, the totals were found to be: Sweden, 21; Edinburgh, and Glasgow, 28; Brunswick, 51; Denmark, 51; Norway, 54; Finland, 62; and Alsace-Lorraine (four opportunities of divergence only), 31. This test, though a rough one, points to the Swedish rates being the most suitable of the series for standard purposes.

When comparing the Swedish rates with other rates in Table B, their most striking feature appears to be that the decline in fertility with advancing age is somewhat more gradual than that of most of the others. If this decline were too gradual to represent the normal state of matters, the effect would be to yield an unduly high standard birth-rate, and therefore an unduly low correction factor, in a population, such as that of Scotland N., with a high average age of wives aged 15–45; and, conversely, a low factor in a population, such as Glamorgan, where the wives marry young. These effects may be studied in Table F by comparing the correction factors obtained on the Swedish basis with those obtained on the basis of Edinburgh and Glasgow, where the diminution in fertility with advancing age is seen in Table B to be more rapid. But in this connection it must be noted that Table C shows that in New South Wales in 1871 and 1881, before artificial conditions had appeared in that country, the decline with advancing age was on the whole quite as gradual as in Sweden. The Swedish figures then, in spite of this peculiarity, appear to be perfectly applicable to the British race. Nor are they alone in manifesting this characteristic, which is exhibited to a much greater degree by the rates for Finland (Table B).

Two further points require to be noted in this preliminary consideration of methods. First, as to the non-inclusion of married women over 45. The English census figures for 1881 only gave facts as to marriage for women over 25 in ten-yearly age-groups, 25–35, &c., and in 1901 the same holds good for towns.* Hence the number of wives aged 45–

* It follows from the above statement that standard birth-rates were calculated in 1881 from the fertility-rates for 25–35, 25–45, instead of 25–30, 30–35, &c. These were derived from the Swedish rates for quinquennial periods by ascertaining the births yielded by the latter in the population of England and Wales (1901) in the age-periods 25–35 and 35–45, and from these numbers calculating the fertility-rates of the decennial age-periods. They were found to be 343 per 1,000 for 25–35 and 200 per 1,000 for 35–45. The error introduced by this larger grouping is very small. (See "Journal of Hygiene," 1905, p. 181.)

50 could not be ascertained. In Table F, column 9, are shown the results obtained by including wives aged 45–50 in the case of Essex and Scotland N. In Essex the greatest difference produced in the birth-rate is only 0.03; in Scotland N. the greatest difference is only 0.27.

Secondly, as to the method of obtaining the corrected illegitimate birth-rates (column 7, Table I, Appendix), and thence, by addition, the corrected total birth-rates (column 9). The proportion per 1,000 of population of women, not wives, aged 15–45, was ascertained for each community,* and the proportion, 132.7 per 1,000 in England and Wales, 1901, was taken as a standard. The crude illegitimate birth-rate per 1,000 of total population in each community was then reduced or increased in accordance with the excess or deficiency of the proportion of women not wives at child-bearing ages. In this case it will be noted that the correction, as in Dr. Farr's method, is only for numbers and not also for age; the proportion of the total birth-rate affected is so small that the further correction is an unnecessary refinement.

Illustrations of Necessity for Corrected Method.

It must be remembered that by the method of calculation adopted in this paper the influence of differences in the proportion of wives and in the ages of these wives has been eliminated, and we are thus enabled to separate between what we may call the *arithmetical* and the *pathological causes* of decline in the birth-rate. France is the best instance of a pathological birth-rate. The term ("natalité pathologique") is used by Dr. Jacques Bertillon, the head of the Statistical Bureau of the City of Paris. France has rather a larger number of wives aged 15–45 than England and Wales per 1,000 of total population. But its corrected legitimate birth-rate is 29 per cent. lower, and its total corrected birth-rate 24 per cent. lower than that of England and Wales. Ireland, on the other hand, has a low crude birth-rate, which becomes one of the highest in Europe when correction is made, for the fact that only 76.5 per 1,000 of population as compared with 117.0 in England and Wales, are wives at child-bearing age, only 32.5 per cent. of the women aged 15–45 being married, as compared with 46.8 per cent. in England and Wales.

Illustrations of the changes produced by correction may be taken from the different countries represented in Table I, Appendix.†

* By subtracting in Table I the figure in column 11 from that in column 10.

† All the instances cited in this section relate to legitimate birth-rates.

Divisions of the United Kingdom.—It will be noted that both in 1881 and 1901 England and Wales had a population constituted so as to favor a higher birth-rate than that of other parts of the United Kingdom, Scotland, and more particularly South Scotland * and Scotland S.W. coming next, and Ireland and Scotland W. and Scotland N.W. having a population which necessitates a low birth-rate. The selected urban counties both in 1881 and 1901, and all the urban districts of England and Wales in the aggregate in 1901, had standard birth-rates favoring a high birth-rate, and the selected rural counties and all the rural districts in the aggregate had standard birth-rates favoring a low birth-rate. A study of columns 3 and 4 in Table I, Appendix, shows the importance of the use of factors of correction. Thus in 1881 Scotland N. had the lowest crude birth-rate of all the divisions of the United Kingdom given in the table, the correction removing it to a place next to the highest of all. Again, comparing 1881 with 1902–03, every crude birth-rate shows a decline, the least decline being 1 per cent. in Ulster, and the greatest 14 per cent. in Scotland N. and N.W. The corrected legitimate birth-rates, however, show an increased birth-rate of 7 per cent. in the corrected legitimate birth-rate of Munster, 13 per cent. in that of Connaught, 1 per cent. in those of Ulster and Leinster, and 3 per cent. in that of Ireland.

The authors draw further illustrations of this sort from a comparison of the crude and corrected birth-rates of the counties of England and Wales and the towns of the United Kingdom, of Australasia, and of foreign countries. These serve simply to sustain the points already made, and are omitted here because lack of space prevents the reproduction of the tables of the Appendix on which they are based.

Comparison of Fertility of the Same Communities in 1881 and 1903, and of Different Communities with each other.

So far we have been concerned with describing a correct method of stating fertility, and with a study of the differences in results obtained by the use of this method. A complete review of the facts relating to the communities enumerated in Tables I–VI, Appendix, can now be taken without any disturbing arithmetical considerations.

* Refer to footnote to Table I, Appendix, for meaning of these divisions.

The survey of such an enormous array of facts can be rendered less confusing by expressing the corrected birth-rate of each community in its ratio to that of one community taken as a standard. As the corrections made have been based on the fertility of Sweden in 1891, this has been taken as the standard, and a Figure of Merit is calculated for each community which expresses the relationship of its corrected legitimate birth-rate to the Swedish standard. This may be calculated in two ways, each giving the same result:—

1. The crude legitimate birth-rate of a community is stated as a percentage of its standard birth-rate; or

2. The corrected legitimate birth-rate of a community is stated as a percentage of the standard birth-rate of England and Wales. Thus, if the county of Durham is taken as an example:—

Durham, crude birth-rate in 1903	= 34.25
" standard "	= 38.04
" corrected "	= 31.43
England and Wales, standard birth-rate in 1901	= 34.91

Then $\frac{3143}{3491} = \frac{3425}{3804} = 0.90.$

If the standard = 100, the Figure of Merit for Durham = 90. The Figure of Merit represents the proportion of potentiality to actuality, assuming—which is scarcely open to doubt—that the capacities for child-bearing are as high in the British as in the Swedish population. That this is so is indicated by the fact that the corrected Irish birth-rate is higher in 1903 than that of Sweden in 1891, and that of Scotland was so in 1881, and there is no reason to suppose that the potential birth-rate is higher in Scotland and Ireland than in England. Confirmation of this is furnished by the county figures given in the table on next page. It will be seen that in 1881 Rutland, Cumberland, Stafford, Cornwall, Westmoreland, and Oxfordshire all had corrected legitimate birth-rates above the Swedish standard (compare also Table C).

In the following pages communities will be compared among themselves (1) in 1881 and (2) in 1901–03. Contrast will then be made between 1881 and 1901–03.

It is convenient in the first instance to enumerate all the communities which both in 1881 and in 1901–03 were above the Swedish standard. They are as follows:—

Communities above the Swedish Standard of 1891 = 100.

	1881.	1901–03.		1881.	1901–03.
Scotland N.W. . . .	117.4	103.8	Cumberland	103.1	—
Bavaria	113.3	101.9	Scotland S.W. . . .	103.0	—
Scotland N.	112.4	—	Munster	102.9	109.9
Belgium	109.0	—	South Scotland . . .	102.6	—
Norway	107.7	102.0	Sweden	101.9	—
North Scotland . . .	107.5		Cornwall	101.6	—
South Wales (excluding		—	Stafford	101.5	—
Glamorgan)	105.1	—	Westmoreland	101.2	—
Prussia	104.7	—	Denmark	101.0	—
New South Wales . .	104.6	—	Saxony	100.4	—
Scotland	104.5	—	Oxfordshire	100 4	—
German Empire . . .	104.4	—	Connaught	—	108.8
Rutland	104.2	—	Ireland	—	101.9

It will be observed that only three countries, and a part of a fourth, remain above the Swedish standard of 1891, as against ten in 1881. Sweden itself has fallen 7 per cent. below its birth-rate in 1881.

Here we omit several tables of other countries and divisions of countries which fall somewhat below the standard in 1881. France, as we should naturally expect, stands at the bottom of the list with a "figure of merit" of 65.1. These tables are followed by others consisting of counties and cities, and here again the French appear at the foot of the list.

Only two urban communities in our list were 20 *per cent. below the standard:*—

Kensington . . . . . 78.8 Paris 47.1

It is evident that the birth-rate in towns was commonly lower in 1881 than in the countries or counties in which they are situate. It is interesting to inquire how far their birth-rate is intentionally * lowered. The case of Dublin is important, as indicating that in a population which is chiefly Roman Catholic, among whom the artificial prevention of pregnancy is banned, there may be a deficiency of 9.5 per cent. below a moderate standard, without, so far as can be surmised, a very considerable use of such measures. That this surmise is correct is confirmed by the fact that in 1903 the corrected

* It is scarcely necessary to say that the word "intentionally" does not include postponement of marriage, as this and other automatic causes of change in the birth-rate have already been eliminated.

birth-rate of Dublin was only 1 per cent. below the standard. Belfast, on the other hand, in 1881 was 3.6 and in 1903 was 4.8 per cent. below the standard. The experience of Dublin in 1881 is probably exceptional. It may have been caused by special local circumstances. The fact that the birth-rate of Dublin in 1903 was within 1 per cent. of the standard, does not appear to favor the view that urban are normally lower than rural birth-rates.

The last eight in the above list of towns are especially interesting. The social position of these towns varies greatly. Thus Huddersfield, Halifax, and Bradford form one group, Berlin a second, Brighton and Kensington a third, and Paris stands alone. Berlin in 1881 (19 per cent. below the standard) may advantageously be compared with Prussia (4.7 per cent. above it). Some cause was operating in Berlin and to a less extent in Hamburg, which was not felt in Prussia as a whole. Edinburgh, 5.7 per cent. below, as compared with Scotland, 4.5 per cent. above the standard, and London, 11.4 per cent. below, as compared with England and Wales, 6.2 per cent. below the standard, show the same phenomenon in a minor degree. The selected rural counties had a birth-rate 2.3 per cent. and the selected urban counties 8 per cent. below the standard; and, speaking generally, the corrected birth-rate in towns in 1881 was lower than that of countries as a whole, and therefore still less than that of rural districts.

1901–03.

Countries and Divisions of Countries in Order of Figure of Merit, 1901–03.

We have already seen that Norway, Bavaria, and Ireland, and Scotland N.W. were still over the standard.

The following were *within 5 per cent. below the standard:*—

Ulster	98.8	Leinster	97.4
Scotland N.	97.7		

. . . The following were over 20 *per cent. below the standard:*—

England and Wales	78.2	Victoria	73.8
Selected Urban Counties	77.9	New South Wales	70.5
Saxony	76.2	France	55.3

. . . The facts that the corrected birth-rate of Victoria is 26.2 per cent., of New South Wales is 29.5, and of New Zealand is 18.5 per cent. below the standard, that the corrected birth-rate of England and Wales is 21.8 per cent. below, that of Scotland 9.3 per cent. below,

and that of Ireland 1.9 per cent. above the standard, are of imperial importance.

Here follows a list of counties and towns in the "order of figure of merit" in 1903. What impresses one at first sight is that these counties and towns are much further below the standard than they were in 1881. For example, in that year only two urban communities were 20 per cent. below the standard. In 1903, out of the 45 towns mentioned, 33 are more than 20 per cent. below the standard, 19 being more than 30 per cent. and 4 more than 40 per cent. below. Speaking of the especially low record of some of these towns, the authors comment as follows:—

Hampstead, 45 per cent. below, Bournemouth, 37 per cent. below, and Kensington and Paddington, 35.9 per cent. below the standard, bear company with the less aristocratic Halifax, which is 43.7 per cent. below the standard. Paris, 65.7 per cent. below the standard, stands in inglorious solitude. Hamburg, 37.8 per cent. below, and Berlin, 46.8 per cent. below the standard, should be contrasted with the German Empire, 8.3 per cent. below, and Prussia, 6.3 per cent. below the standard. Whatever cause is operating in Germany to produce a low birth-rate is at present confined chiefly to great urban centres. This is in marked contrast to the experience of England and its colonies, in which the reduction of birth-rate is much more widespread.

Contrast of 1881 with 1901–03.

Having compared communities between themselves in 1881 and in 1901–03 respectively, it is now necessary, in order to complete the picture, to ascertain the relative position of each community at the two periods.

Countries and Divisions of Countries, 1881 *and* 1901–03.

An increase of corrected legitimate birth-rate was shown in the following:—

	Per Cent.		*Per Cent.*
Connaught (96.2) *	13	Ulster (98.1)	1
Munster (102.9)	7	Leinster (96.8)	1
Ireland (99.1)	3		

* In this and the following lists the figure representing the Figure of Merit in 1881 is given in parentheses, so that in each case it can be seen whether the percentage increase or decline is from a high or low original position.

Ireland and all its divisions alone among all the countries for which figures could be obtained show an increased fertility. Such are the wonders effected by a corrected statement, although the crude legitimate birth-rate of Ireland in 1903 was 22.5, and that of England and Wales 27.3 per 1,000 of population. The low crude birth-rate of Ireland is owing to the fact that a large proportion of the child-bearing population of Ireland has been transferred to America. Those remaining in Ireland who are of child-bearing age are adding to the population at a much higher rate than the corresponding population of England, as shown by the fact that the corrected legitimate birth-rate of Ireland is 35.6 and that of England and Wales 27.3 per 1,000 of population. They are also adding to the population of Ireland at a higher rate than in 1881. . . .

The other countries may be classified according to percentage decline in corrected birth-rate between 1881 and 1901–03 as follows:—

5–10 per cent.:—

	Per Cent.		*Per Cent.*
Sweden (101.9)	7	Italy (95.7)	7

10–15 per cent.:—

	Per Cent.		*Per Cent.*
Scotland S.W. (103.0)	10	German Empire (104.4)	12
Bavaria (113.3)	10	South Wales * (105.1)	12
Prussia (104.7)	11	Scotland N. (112.4)	13
South Scotland (102.6)	12	Scotland (104.5)	13
Scotland N.W. (117.4)	12	North Wales (97.2)	13

15–20 per cent.:—

	Per Cent.		*Per Cent.*
Denmark (101.0)	15	England and Wales (93.8)	17
France (65.1)	15	Selected rural counties of England and Wales (97.7)	18
North Scotland (107.5)	15	New Zealand (99.9)	18
Selected urban counties of England and Wales (92.0)	15		

20–25 per cent.:—

	Per Cent.		*Per Cent.*
Saxony (100.4)	24	Victoria (98.1)	25
Belgium (109.0)	24		

Over 25 per cent.:—

	Per Cent.
New South Wales (104.6)	33

The preceding figures in the main tell their own tale, if the figures in parentheses, indicating the relative position from which the decline has occurred, be kept in view. . . .

* Excluding Glamorganshire.

Tables giving decrease in the counties of England and Wales, and also all towns in the following list except those in the highest and lowest classes, are omitted here. No county showed an increase.

Towns, 1881 *and* 1903.

One town, Dublin, has improved its position, showing an increase of 9 per cent. on 1881 (90.5). In two the *decline has been less than 5 per cent.:—*

	Per Cent.		*Per Cent.*
Belfast (96.4)	1	Liverpool (89.0)	4

. . . 25 per cent. and over:—

	Per Cent.		*Per Cent.*
Bradford (80.8)	26	Burnley (93.8)	32
Leicester (91.2)	26	Halifax (83.4)	32
Derby (93.2)	27	Northampton (93.8)	32
Paris (47.1)	27	Berlin (81.0)	34
Hamburg (89.8)	31	Hampstead (85.3)	36
Blackburn (95.7)	32		

The percentages scarcely need detailed comment, as they tell their own story. Dublin alone has improved its position. The other towns showing a decline under 10 per cent. all, with the possible exception of Bethnal Green, have a large proportion of Irish in their populations. . . .

We may broadly say that Paris anticipated by many years the experience of other cities and towns, but that most other towns are pursuing the same course at varying intervals and with lagging or hastening pace. Many towns—for instance, Berlin, Bradford, Brighton, Halifax, Hampstead, Kensington, and Oldham—had already arranged in 1881 for a low birth-rate. The majority of towns have now started on the same course.

Omitting the discussion of the decline in the illegitimate birth-rate between 1881 and 1903, which was generally more marked than that of the legitimate, the conclusions arrived at by the authors as a result of their study may be summarized.

It is evident that human fertility is on the decline in practically every community. This does not appear in the form of an increased number of sterile marriages so much as in

that of smaller families.* This points to conscious limitation rather than to physiological infertility. The standard birth-rate has declined faster in rural England than in the cities since 1881. This tends to show that *urbanization* will not account for the general decrease. The exceptional case of Germany, where the reverse of this is true, is held to be due to the fact "that the operative causes of a low birth-rate have not yet affected the rural population of that country to any great extent." *Industrial conditions* and *race* do not account for the changes. *Religion* seemed to have no connection with the variations in birth-rate in 1881, but in 1902-03 Roman Catholic countries show the least tendency toward a decline.

It was found that there is a close relationship between *social conditions*, particularly the degree of prosperity, and fertility as regards classes in the same community, but that the evidence was not convincing where large communities or countries were compared. The following tables show this:—

Dr. Bertillon has since kindly supplied to one of us the following statement of the number of legitimate births per 1,000 married women aged 15–50 in Paris and Berlin:—

TABLE I.

Classification.	Paris.	Berlin.
Very poor quarters	143	214
Poor quarters	128	198
Comfortable quarters	109	192
Very comfortable quarters	96	172
Rich quarters	94	145
Very rich quarters	65	121

In the following table we have made a similar calculation for London, substituting the more complete correction described in this paper for the method of correction used in Table I. The metropolitan

* The authors cite A. A. Young's paper on the birth-rate in New Hampshire which appeared in No. 71 of these Publications, in support of this assertion.

boroughs have been divided into six groups, which generally resemble Dr. Bertillon's groups. The classification has been based on the average number of domestic servants to every 100 families as displayed by the census returns for 1901.

TABLE J.—Groups of Metropolitan Boroughs.

	Number of Domestic Servants per 100 Families.	Corrected Birth-rate, 1903.			Relative Corrected Birth-rate, that of London being taken as 100.	
		Legitimate.	Illegitimate.	Total.	Legitimate.	Illegitimate.
Group 1 .	under 10	30.78	0.78	31.56	118.8	85.7
" 2 .	10–20	24.81	1.01	25.82	95.8	111.1
" 3 .	20–30	24.90	0.73	25.63	96.1	80.2
" 4 .	30–40	24.82	0.68	25.50	95.8	74.7
" 5 .	40–50	23.62	1.74 *	25.36	91.2	191.2
" 6 .	over 60	20.04	0.41	20.45	77.3	45.1
Total .	—	25.91	0.91	26.82	100.0	100.0

. . . It will be observed that groups 2, 3, 4, and 5, comprising 64.8 per cent. of the total population of London, had a corrected total birth-rate which only varied between 25.36 and 25.82. The two extreme groups show marked differences, the rich districts at one end of the scale having a corrected total birth-rate of 20.45, and the very poor districts at the other end of the scale a corrected total birth-rate of 31.56 per 1,000 of population. The former of these birth-rates affects 9.7 per cent., the latter 25.4 per cent., of the total population of London.

The above facts suggest the conclusion that among the rich in London the prevention of child-bearing is systematically and largely practised, that among the very poor the practice is probably almost unknown, and that the mass of the population which lies between these two social extremes occupies an intermediate position in regard to such preventive measures.

Social Suicide.

The last sentence anticipates the general conclusion to which an impartial view of the whole field of corrected facts seems to us inevitably to lead.

* The excessive illegitimate birth-rate in Group 5 was due entirely to the high rate in Marylebone, in which is situate Queen Charlotte's Lying-in Hospital.

The decline of birth-rate is not due to increased poverty.

It is associated with a general raising of the standard of comfort, and is an expression of the determination of the people to secure this greater comfort.

It is not caused by greater stress in modern life, but is a consequence of the greater desire for luxury. Possibly the raising of the age for leaving school, and allied changes as to work, have aided in producing the result by preventing children from being an early source of profit. These and allied motives have made parents look round for the means of keeping their families within "prudent" limits. The gradual slackening of the religious restraints, which were formerly to a much greater extent associated with family life, have doubtless aided in making husbands and wives willing to utilize such preventive means as they have been able to discover. Increased education has helped in securing access to the necessary information, and the greater aggregation of populations in towns has doubtless supplied not only increased facilities for the communication of information on the subject, but also for the purchase of the necessary appliances. Many druggists are stated to make a large share of their income in this way.

A marked impetus in this direction was given in England by notorious trials in 1877. The special experience of towns like Halifax, Huddersfield, and Northampton implies, and is known to be associated with, a special local propagandism. What caused the earlier implication of France in this policy of short-sighted prudential selfishness it would be beyond the scope of this paper to discuss. . . . And with this we must look for a lower standard of moral outlook, a lowering of the ideal of married life, and a consequent deterioration of the moral, if not also of the physical, nature of mankind. France has anticipated the rest of the world, and has thus come near the consummation of its social *felo-de-se*. But it is only a question of decades, in the absence of a great change in the moral standpoint of the majority of the people, before others follow in the same direction, possibly even at the same pace. The outlook is gloomy, and we cannot look with confidence to the help which is likely to come either from preaching or medical teaching. . . .

The following table and postscript are reproduced because of their peculiar interest to Americans. Here we see applied to our own population problems this new method of measuring fertility. The results will confirm the fears of those who have been warning the American people against race suicide.

TABLE VII—CERTAIN AMERICAN STATES AND CITIES

TABLE VII—Certain American States and Cities.

		1	2	3	4	5	6	7	8	9	10	11	12
		Standard Legitimate Birth-rate.	Factor for Correction of Crude Legitimate Birth-rate.	Crude Legitimate Birth-rate.	Corrected Legitimate Birth-rate.	Factor for Correction of Illegitimate Birth-rate.	Crude Illegitimate Birth-rate.	Corrected Illegitimate Birth-rate.	Crude Total Birth-rate.	Corrected Total Birth-rate.	Number per 1,000 of Total Population of		Wives Aged 15–45 per Cent. of all Females of same Age.
											Females Aged 15–45.	Wives Aged 15–45.	
Boston	1900	39.04	0.8942	—	—	—	—	—	29.15	26.07	277.2	128.8	46.4
Rhode Island	1900	38.62	0.9039	25.55	23.09	1.002	0.35	0.35	25.90	23.46	259.6	137.2	49.0
	1875	41.87	0.8338	23.94	19.96	1.037	0.24	0.25	24.18	20.21	261.7	133.7	51.1
Providence	1900	39.34	0.8874	25.49	22.62	0.911	0.47	0.43	25.96	23.05	275.3	129.7	47.1
	1875	43.86	0.7959	—	—	—	—	—	26.46	21.06	278.3	140.4	50.5
Boston:													
Native-born	1900	28.42	1.2284	14.82*	18.20	—	—	—	—	—	239.0	92.6	38.8
Foreign-born	1900	58.96	0.5921	52.46*	31.06	—	—	—	—	—	351.2	196.6	56.0
Rhode Island:													
Native-born	1900	30.88	1.1305	—	—	—	—	—	15.09†	17.01	232.8	100.6	43.2
Foreign-born	1900	55.67	0.6271	—	—	—	—	—	49.37†	30.96	318.8	185.6	58.2
Providence:													
Native-born	1900	31.01	1.1258	14.24*‡	16.00	—	—	—	—	—	250.1	101.4	40.5
Foreign-born	1900	57.36	0.6086	51.06*‡	31.08	—	—	—	—	—	330.4	190.8	57.8
Native-born	1875	37.24	0.9374	—	—	—	—	—	17.18‡	16.10	—	—	—
Foreign-born	1875	61.74	0.5654	—	—	—	—	—	49.15‡	27.79	—	—	—

Note.—All birth-rates are for 1900 and 1875 except where otherwise stated.

* Births of known parentage.

† Births in 1901.

‡ In this case all births of foreign mothers and native fathers are credited to foreign-born population, and all of native mothers and foreign fathers to native-born population. This fact leads to a slight underestimation of the difference in fertility of the native and foreign populations as compared with the 1900 results.

Postscript on American Results (3d January, 1906).

Few States record their birth-rates accurately. Those doing so belong chiefly, if not entirely, to the New England group, and it is to the State of Rhode Island and the cities of Boston and Providence in this group that our attention has been directed.

We have been able to compare 1875 with 1900 in the case of Rhode Island and its capital, Providence. The corrected birth-rates for the former are:—

Legitimate	19.96 in 1875 and 23.09 in 1900
Total	20.21 in 1875 and 23.46 in 1900

and for the latter:—

Legitimate	? in 1875 and 22.62 in 1900
Total	21.06 in 1875 and 23.05 in 1900

Thus, while these American rates are exceedingly low, they differ from the great mass of other birth-rates examined by us in showing a tendency to increase. This tendency can also be seen in the official crude rates. To what extent it may be due to increasing efficiency of registration we are not in a position to judge.

American birth registration, when secured at all, gives much more information than our records; *e.g.*, age and nationality of parents. The returns on the latter point render it possible to demonstrate the extent to which the native and foreign elements in the population are respectively contributing to the birth-rate. The following results have been obtained:—

Boston, 1900.

	Birth-rate.
Native born	18.20
Foreign born	31.06

Providence, 1901.

	Birth-rate.
Native born	16.00
Foreign born	31.08

These are corrected birth-rates founded upon all births recorded where the nationality of both parents was known:—

Rhode Island, 1901.

	Birth-rate.
Native born	17.01
Foreign born	30.96

These are corrected birth-rates founded upon all the births of the year as divided into native, foreign, and mixed births in a table in the official registration report for 1903.

[The year 1901 was selected in the case of Providence and Rhode Island as being nearer the census date, 1st June, 1900, than 1903, and the foreign and native born sections of the population are assumed to have increased in equal proportions during the intervening year.]

Thus in all three cases the foreign is almost double the native birth-rate, the latter being about as low as that of Paris.

But this difference, startling as it is, does not adequately represent the contrast between the fertilities of the foreign and native sections.

(1) It was thought best to get over the difficulty of births of mixed parentage by adding half of them to the native and half to the foreign births. This, in the light of the preceding statistics, must be regarded as having the effect of somewhat increasing the native and decreasing the foreign true total of births. In some unascertainable proportion a larger number of the resulting births should have been credited to the foreign than to the native population. The number of such mixed births is considerable.

(2) It may, perhaps, be assumed that the whole of the imported excess of fertility is not lost in the first generation, and that the natives born of foreign parentage are more fertile than natives born of native parentage. If this be so, it may well mean that the corrected birth-rates for the latter section of the communities are considerably lower than 16–18, the rates for the whole of the native born, inasmuch as the native born of foreign parentage exceed in number those of native parentage.

The chief bearing of these two points is on the relative fertility of the native and foreign populations of these American communities. But it has also to be remembered that the actual contribution of the two sections to the populations is not represented by their fertilities. The proportion of married to total women aged 15–45 varies in Boston, Providence, and Rhode Island from 38.8 to 43.2 per cent. for the native born, and from 56.0 to 58.2 for the foreign born. The rate of increase of the native born population is therefore less than the corrected birth-rates alone indicate. The crude birth-rate in each of the above three communities is about 15 per 1,000; for the really American element it must, in view of the above considerations, be considerably below this figure. It is almost certain, therefore, that this element is actually decreasing in these populations.

Contrast this condition of things with that of Paris. This city has a corrected birth-rate of 16.65, not very different from that of the

above three American communities; but a crude birth-rate—owing to its larger proportion of women married—of 20.6.

It is evident, then, that, taking into consideration the probable understatement of the facts in the American results, the condition of voluntary prevention of child-bearing in the native populations of Rhode Island and Boston has gone far beyond that reached by Paris. Whether it has touched bottom, as indicated by the registered increase of the birth-rate since 1875, or whether this increase is caused by greater completeness of registration, must be regarded as doubtful. In view of the much higher percentage of married amongst the foreign than the native born, it is of interest to compare the marriage figures of native born of native parents and native born of foreign parents. In this case, contrary to what one would have expected, the rates are much higher for the former class,—45.8 against 35.4 in column 12 for Providence, 1900; and 42.1 against 33.5 for Boston.

It will be impossible to extract so largely from Mr. Yule's paper because of the large number of diagrams which it contains. Moreover, a considerable portion of it is taken up with a discussion of the changes in marriage-rates, and it is only in the latter part of his paper that he attacks the same problem as the other writers.

In his treatment of this question he makes use of different correction factors, but in general his results and conclusions do not differ materially from those arrived at by Messrs. Newsholme and Stevenson. He shows by a diagram the course of the crude birth-rate in England and Wales from 1850 to 1900. There was a gradual rise in the legitimate birth-rate from about 33 per 1,000 in 1850 to 36.3 in 1876, followed by a practically continuous fall to 28.7 in 1900.

The first problem is to find how far the changes in the legitimate rate have been effected by changes in the proportion of married women to the population and in their relative ages, and how much by other causes. The changes in the number of married women per million persons living are shown in Table III, a table taken from the General Report of the last Census. It will be seen that they have been by no means so considerable as the changes in the proportions of unmarried, and less regular, but of some importance. The proportion rose by some 3 per cent. from 1851 to 1871, fell by about 2½ per cent. to 1891,

TABLE III.—Married Females per Million Persons Living.

[Census 1901, General Report.]

Age.	1851.	1861.	1871.	1881.	1891.	1901.
15–20 . . .	1,241	1,481	1,522	1,248	995	781
20–25 . . .	14,954	16,007	15,908	15,477	14,287	13,769
25–35 . . .	51,235	51,841	52,090	51,735	51,502	54,754
35–45 . . .	44,361	46,272	44,989	44,860	45,053	47,641
45–55 . . .	30,666	31,987	32,655	31,201	31,767	32,647
55–65 . . .	17,270	17,800	18,164	18,146	17,508	18,119
65– . . .	8,485	8,484	8,522	8,202	8,414	8,063
All ages . .	168,212	173,872	173,850	170,859	169,526	175,774

and then rose sharply again by 3½ per cent. during the last decade of the century. The fall from 1871 to 1891 is largely due to the falling marriage-rate, the rise from 1891 to 1901 to the fallen birth-rate, which has decreased the proportion of the young and correspondingly thrown up the proportion of the older, both married and unmarried.

If we reduce the legitimate birth-rates in the several census years to the proportion of married women in 1901, we obtain the results shown in Table IV. In column 3 are given the correction-factors 175,774/168,212, &c., and in column 4 the legitimate birth-rate as

TABLE IV.—Reduction of the Legitimate Birth-rate to (1) the Total Proportion of Married Women in 1901; (2) the Proportion of Married Women under 45 Years of Age.

1 Year.	2 Legitimate Birth-rate.	3 Correction Factor for Proportion of Married Women.	4 Column 2 corrected by Column 3.	5 Correction Factor for Married Women under 45.	6 Column 2 corrected by Column 5.
1851	31.4	1.045	32.8	1.046	32.8
1861	32.4	1.010	32.8	1.012	32.8
1871	33.0	1.012	33.4	1.021	33.7
1881	32.2	1.029	33.0	1.032	33.2
1891	30.1	1.037	31.2	1.046	31.5
1901	27.4	1	27.4	1	27.4

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portion of married women to the population would seem, therefore, to be partly responsible for the earlier rise and the commencement of the fall, and some other cause for the final fall, which has in fact been partly masked by a rise in the numbers of married women. If we further take account of the changes in the ages of married women in a very rough fashion, by simply neglecting those who are over forty-five years of age, the same result is still further emphasized, as shown in columns 5 and 6. The correction factors are larger than before, and the fall between 1891 and 1901 is increased from 2.7 in the crude rate to 4.1 in the corrected rate.

But it is desirable to obtain, if possible, a more complete correction, allowing the proper weights in each year to the married women of different ages in proportion to their fertility. Unfortunately there are no official data in this respect for England; and, if the correction be made at all, it must be made on the basis of unofficial data, or official data for some other country. . . . In 1855, when systematic registration of births in Scotland was first established, the schedule in use was much more elaborate than the present one, and demanded, amongst other information, the age of the mother. The data so obtained were reduced by Dr. Duncan for legitimate births in Edinburgh and Glasgow in that year by comparison with the census returns for 1831 and 1861, and he further handed over the reduced data to Professor Tait, who contributed some mathematical chapters to the book. Professor Tait pointed out at once that an extremely simple law seemed to express, within the limits of error, the fertility of these married women at different ages; namely, *the percentage of wives of any one age who are mothers within one year varies directly as the difference between that age and fifty.* In symbolic form, if f_t is the percentage of wives of age t who are mothers within a year,

$$f_t = k(50 - t)$$

For the Edinburgh and Glasgow women Professor Tait found k, which may evidently be treated as a kind of "coefficient of fertility," equal to 1.5. . . .

I do not suppose this law to be anything but a rough empirical formula, giving the results sufficiently closely for the age-groups used. . . . But for the purposes of weighting a very exact law is not essential,—one may even say not possible, for the form of the law itself may be subject to change,—and I think Tait's law possesses all the accuracy needful. Further, the simple linear law has two great advantages: (1) it permits of the immediate calculation of the relative fertilities of groups of any age-limits without the necessity of interpolating be-

tween observed results,—a very useful property where different census returns give different groupings; and (2) it introduces a "coefficient of fertility" with a direct and simple physical meaning. I have not attempted to apply the law to other countries than England, and cannot say how far such an application may be legitimate. . . .

The age-groups for married women given in the English census (Table III) are 15–, 20–, 25–, 35–45, and for these groups Tait's law gives the percentages of wives bearing children in each year as 49, 41, 30, and 15. Taking these percentages on the number of married women in each age-group to a million living as given in Table III, we can calculate the birth-rate to be expected on the basis of Tait's law. This is a measure of the *potential fertility of the population*, taking into account the numbers and ages of the married women only.

The results of the calculation are given in Table V. The potential birth-rate reached a maximum in 1861, fell steadily to 1891, and rose sharply again in the last decade of the century,—a rise indirectly due, as we have seen, to the fallen birth-rate. Reducing the actual birth-rates in successive census years to the potential birth-rate of 1901 by the factor of column 4, the corrected rates of column 5 are obtained. If these are compared with the more roughly corrected rates of Table IV, columns 4 and 6, it will be seen that they are a little lower than either in the earlier years; and, curiously enough, run closer to the rates corrected by grand totals of married women (column 4) than to those corrected by totals of married women under 45 (column 6). . . .

The values of the coefficients of fertility k are given in the last column, and again emphasize the great magnitude of the drop in fertility during the last decade. The coefficient fell only 0.01 between 1871 and 1881, 0.08 in the next decade, 0.19 in the last. For some reason or other the actual fecundity of married women has been falling with increasing rapidity during the past thirty years, and it is to this, and to no mere changes in the proportion of married women to the population, that the fall in the rate is due. The rate of acceleration of the fall is, however, a little exaggerated by the preceding figures, for the birth-rates used in Table V are rates for single years, and the rate for 1891 was exceptionally high; if averages for the three years 1850–52, 1860–62, &c., be taken to minimize irregularities, Tait's coefficients were 1.64, 1.63, 1.69, 1.66, 1.55, 1.39. The values for 1871 and 1891 are the only ones altered, and the differences since 1871 were 0.03, 0.11, 0.16.

TABLE V.

1 Year.	2 Legitimate Birth-rate.	3 Potential Birth-rate from Tait's Law.	4 Correction Factor to 1901.	5 Column 2 corrected by Column 4.	6 Tait's Coefficient *k*.
1851	31.4	28.76	1.029	32.3	1.64
1861	32.4	29.78	0.994	32.2	1.63
1871	33.0	29.64	0.998	32.9	1.67
1881	32.2	29.20	1.014	32.6	1.66
1891	30.1	28.55	1.037	31.2	1.58
1901	27.4	29.60	1	27.4	1.39

Mr. Yule proceeds at this point to discuss the effects of *social conditions* upon the birth-rate. He finds that the crude birth-rate fell between 1871 and 1901 in both "upper-class" and "lower-class" districts. The fall was 25 and 11 per cent. respectively, but the fertility of married women, as measured by Tait's coefficient, fell only 19 per cent. in the upper-class and not at all in the lower-class districts. He then goes on to show the influence of economic factors on the birth-rate. He finds that there are oscillations in the birth-rate corresponding roughly to the "short-period trade-cycles." Commenting on this, Mr. Yule says:—

> The fact that the birth-rate is, apparently, sufficiently sensitive to economic factors to respond even to the short-period cycle, gives at least some presumption that such factors may have been operative to an important extent in bringing about the secular changes that have taken place during the last fifty or sixty years. I confess to a certain prejudice towards the belief that, when deep-seated social changes of this kind occur, there is an economic driving force behind them; that a growing postponement of marriage and increasing limitation of the number of children, both in town and country, are not sufficiently explained by any postulated growth either of prudence on the one hand or immorality on the other.

In order to carry the comparison as far back as possible, birth-rates being unavailable before the Registration Act

of 1838, Mr. Yule gives the following table showing the percentage of increase in population in England in conjunction with index-numbers of prices. This is only a rough test, as no correction for immigration or emigration has been applied.

The percentage increases of population for each intercensal period are given in Table VIII, column 2. For the course of prices I took

TABLE VIII.

1 Period.	2 Percentage Increase of Population, England and Wales.	3 Period.	4 Average Index-number.*	5 Period.	6 Average Index.*
1801–11 . .	14.0	1797–1807	156	1791–1801	142
1811–21 . .	18.1	1807–17	156	1801–11	165
1821–31 . .	15.8	1817–27	124	1811–21	142
1831–41 . .	14.5	1827–37	101	1821–31	108
1841–51 . .	12.9	1837–47	96	1831–41	103
1851–61 . .	11.9	1847–57	89	1841–51	86
1861–71 . .	13.2	1857–67	99	1851–61	94
1871–81 . .	14.4	1867–77	100	1861–71	100
1881–91 . .	11.7	1877–87	81	1871–81	95
1891–1901 .	12.2	1887–97	61	1881–91	75

Jevons' and Sauerbeck's index-numbers, reducing the former to the standard of the latter in the ratio of their averages during the overlapping years 1846–65. The birth-rate of any year being dependent on the average price level of several years preceding, and therefore lagging behind the price movement, I worked out, for comparison with the increase-rates, the averages of these index-numbers for the eleven-year periods 1797–1807, 1807–17, &c. (column 4). They exhibited an agreement which is certainly fairly close. As the increase-rates fell from 18.1 per cent. in 1811–21 to 11.9 in 1851–61, the average price index-numbers fell from 156 to 89. As the increase-rate then rose from 11.9 to 14.4, the index-numbers rose from 89 to 100. Finally, as the increase-rate fell from 14.4 to 11.7 and 12.2 (the latter unduly large, owing to the low death-rate, and the former unduly low, owing to high emigration), the index-numbers fell from 100 to 61. In column 6 are given the average index-numbers for the eleven years

* Based on Jevons' and Sauerbeck's numbers; the former reduced to Sauerbeck's on the basis of the overlapping years 1846–65.

preceding each census decade, and these exhibit a still closer correspondence, though this may be in part accidental. In the earlier part of the century, prices fluctuated so violently that a few years' difference in the period may make considerable differences in the average. . . . I feel myself almost compelled to the belief that the course of prices, either directly by its influence on consuming power and on profits, indirectly by effects on trade, or more indirectly (if it be possible), as an index to the course of some other variable, has been, through the past century, the factor of most outstanding importance in the rate of reproduction of the race. Let me say again that this is not to exclude the presence of other factors, but merely to rank their importance somewhat lower in the scale.

There remains, however, the fact that the fall in the fertility coefficient was greater for the decade 1891–1901 than for any previous decade, and that this by no means corresponds with the course of prices. There must then have certainly been some other cause or causes at work to effect this depression, and these are probably the same as have effected the corresponding virtual depression of the marriage-rate during the same period. I would like to raise the question whether a contributory cause may not conceivably be the rapidly increasing pressure on the labor market, brought about in part by the high birth-rates immediately preceding 1876, and in part by the great fall in the death-rate, which has enormously increased the supply of adults provided by a given birth-rate. Taking the laboring population as consisting mainly of males between, say, 20 and 55 years of age, I find that their numbers increased by 10 per cent. between 1851 and 1861, by 12 per cent. between 1861 and 1871, by 14 per cent. in each of the following decades, and by no less than 19 per cent. during the ten years 1891–1901. This is a very large and quite abnormal increase, not produced by any present demands for labor, but in part by the "demand" of 1863–73, and in part by a cause which has nothing to do with trade or employment,—the fall in the death-rate. I do not see how such a rapid and uncalled-for rise in the supply of labor could well fail to disturb the market for it, emphasize the problem of unemployment at every recurring trade depression, and tend to lower both marriage and birth-rates amongst the wage-earning classes. If this be, at least, a partial cause so far as these classes are concerned, the next ten or fifteen years should see some relief, for the rate of increase of adults will be rapidly lowered as the recent values of the birth-rate begin to take effect (provided always the death-rates do not fall *pari passu*, as is hardly possible).

Many interesting sidelights were thrown on the points presented in these two papers by the discussion which followed their presentation. Lack of space prevents the reproduction of many of the remarks of the various speakers, but the following have been selected as especially pertinent:—

Mr. Walford said there could not be any doubt that there was only one cause operating in all civilized countries towards the decrease in the birth-rate. Popular magazines openly advertised means for checking the population, and the same facts could be seen in every chemist's shop. This country, however, had not yet advanced so far in this direction as, for instance, Germany. Unless legislation prohibited such advertisements, the Anglo-Saxon race would die out, as other races had died out before. . . .

Mr. G. H. Wood said both writers seemed to have lost sight of the fact that the turning point of the birth-rate of a country did not necessarily mean the turning point of the birth-rates of the separate towns and counties in the country. He objected to calling Dr. Newsholme and Dr. Stevenson's new figure a birth-rate, which it was not, and it ought to be called an "Index of Fertility," or something of that kind. He took the crude birth-rate for this reason: that if one took the table at the end of Dr. Newsholme's paper, and worked out a series of index-numbers for the towns given there, or the counties, and took 1881 as 100, the index-number for 1901 or 1903 was practically the same whether one used the corrected or the uncorrected birth-rate. The one place in which he could see any great variation was Liverpool. . . . It seemed to him there was a more subtle connection between the economic factors and the birth-rate than even the one which Mr. Yule had discovered. Whereas in the net birth-rate of England and Wales and several other countries the turning point was in 1876, the large industrial centres reached the turning point at a much earlier period; and, singularly enough, where women and children had been largely employed in industry, the birth-rate seemed to have arrived at its turning point some time before that for the whole country. 1876 being the date of change for the whole country, the birth-rate in Huddersfield turned in 1872, or earlier; in Preston in 1866 or 1867; in Liverpool in 1864, or earlier; in Bradford, 1870 or 1874; in Aberdeen, 1870; and in Blackburn as early as 1851, with certain other little maxima at 1860, 1868, and 1872, and there was a fall of 7½ per cent. by 1876. In Glasgow, again, it began in 1857. He expected to find, when he got the revised figures for other places,

that the employment of women in industry was really the most serious factor in the change in the birth-rate. . . .

Mr. T. A. Welton said he highly appreciated both these papers, and he agreed with Dr. Newsholme and his colleague as to the social suicide to which they referred as being the main operating cause of the decline in the birth-rate. His attention was called to the subject originally by the discovery that the number of children under 15 appearing in the census of 1901 was about 2,000,000 less than it would have been if the social conditions had remained stationary for twenty years. That was a gigantic fact which required very careful consideration. . . .

Dr. Shadwell said he wished to express his personal gratitude to the authors of these papers. He had studied this subject for a considerable time, not only statistically, but on the spot, in a large number of industrial centres in this country and others. Two years ago he read a paper at Zion College, in which he came to exactly the same conclusion as Dr. Newsholme. Some of the results were particularly interesting to him, amongst them the proof of the great decline in fertility in Berlin and Hamburg. Those cases and others emphasized the conclusion that this process was associated with the rising standard of comfort and the seeking after luxury. Those towns represented pre-eminently the great wealthy cities of pleasure in modern Germany, and it was in such places that this process went on at the most rapid rate. . . . In the United States the vital statistics were almost worthless, but, so far as they went, they showed that the national vitality was lower than even in France; in fact, the native stock was dying out rapidly. In the city of Providence, which had the best statistics in America, the population was roughly divided into two-thirds native and one-third foreign, but the one-third produced two-thirds of the children. Of course the age condition was very different, but the native population went in for small families. Its birth-rate in 1901 was 14.7 per 1,000, and the death-rate was 19.7, or a deficiency of 5 per 1,000. . . .

Dr. Newsholme, in replying for Dr. Stevenson and himself, said . . . Mr. Wood considered that the crude birth-rates were equally as good as the corrected rates for short periods, but numerous instances had been given in their paper showing that the crude rates might be most misleading. The question of using the term "index of fertility" instead of "corrected birth-rate" was one of wording, but the use of "corrected birth-rates" was completely analogous to that of "corrected birth-rate" by the Registrar-General. . . .

Mr. Yule said that he concurred with nearly all the remarks made by Mr. Newsholme, and might accordingly abbreviate his own reply. He said . . . the question of the employment of women in industry and its influence on the birth-rate was of the highest importance, and he was glad to know that Mr. Wood's investigations were being continued. . . . In conclusion, he would like to make a few remarks on the general question as to the causes of the decline in the birth-rate, to which Dr. Newsholme had also referred in his reply. From the same data he reached the opposite conclusion. It was precisely the extraordinary similarity of the changes in very widely different countries that made it very difficult for him to accept the purely moral theory. . . . If there had been a change in that way,—and possibly it was the case,—why in the world did this change take place in so many different countries in almost the same year? People did not change their morality in a large number of different countries, or even in one country, at a given point of time without some extremely definite cause; and, if there had been that change in moral tone for which Dr. Newsholme and others argued, he was still inclined to regard economic factors of some kind as lying behind it. It was true, as remarked by Dr. Newsholme, that most of the economic conditions of the countries with which he and Dr. Stevenson had dealt had been very different, but it was the more worth noting that his (Mr. Yule's) investigations had led him to assign the greatest importance to precisely that factor—the course of wholesale prices—which would be very similar all over Europe at least. If there had been a change in "moral tone," but one brought about by economic factors, the question arose whether there was any real distinction between the two views as expressed by Dr. Newsholme and Dr. Stevenson's paper and his own. Two views were certainly possible. The fall in the birth-rate might be regarded on the one hand as due solely to changes in the environment surrounding the individual, who had remained himself unchanged, or on the other as due to changes in the individual, while the environment was unchanged (in any essential respect). The first was the purely economic theory, the second the moral theory, —whether the changes in the individual were regarded as ultimately due to economic causes or no.

It is apparent from a reading of the papers and the discussion which followed that, while the several investigators differed considerably as to method, they arrived at practically the same results, though not at the same conclusions in their attempts to interpret and account for those results.

As has already been noted, a newspaper discussion followed the publication of these papers, and some extracts from letters in the *Times* may be of interest in this connection.

In a letter in the issue of October 12 Sidney Webb writes as follows:—

"If only the devastating torrent of children could be arrested for a few years," wrote one of the most sympathetic friends of progress not so very long ago, voicing the opinion of the economists from Malthus to Fawcett, "it would bring untold relief." Not many years have passed, and his aspiration is fulfilled. One of his Majesty's Inspectors of Schools, lately revisiting, after some interval, a public elementary school in the centre of London, remarked that, since he was there before, the "babies' class" had ceased to exist. Between 1896 and 1905 the total population of the County of London is estimated to have increased by 300,000 persons. But the total number of children between three and five years of age who were scheduled by the vigilant school-attendance officers positively fell from 179,426 to 174,359. . . .

What does this continuous fall in the birth-rate mean? What will be its results upon our economic and social relationships, what upon the future of the race? . . . The subject has accordingly been under investigation during the past year by a committee of the Fabian Society; and the present article sets forth some of the results,—formulated, however, by the present writer in his own way, for which the society as a whole has no responsibility.

1. The decline in the birth-rate is not merely the result of an alteration in the ages of the population, or in the number or proportion of married women, or in the ages of these. . . .

2. The decline in the birth-rate is not confined to the towns, nor (so far as England and Wales is concerned, at least) is it appreciably, if any, greater in the towns than it is in the rural districts.

Human fertility may possibly be normally slightly lower in the towns than in the rural districts, and it is sometimes suggested, especially by German authorities, that the fall in the birth-rate is to be accounted for by progressive "urbanization." But English statistics afford no support to this hypothesis. . . .

3. The decline in the birth-rate is exceptionally marked where the inconvenience of having children is specially felt.

There is not much evidence to be adduced under this head, but what there is is of some significance. . . . It is, therefore, of some significance that the ten towns in all England in which the relative fall in the birth-rate between 1881 and 1901 is most startlingly great are Northampton, Halifax, Burnley, Blackburn, Derby, Leicester, Bradford Oldham, Huddersfield, and Bolton,—all towns in which

an exceptionally large proportion of married women are engaged in factory work, in textiles, hosiery, or boots. I can adduce no statistics of the decline in the birth-rate among the married women teaching in schools; but it is known to be great.

4. The decline in the birth-rate appears to be specially marked in places inhabited by the servant-keeping class. . . .

5. The decline in the birth-rate appears to be much greater in those sections of the population which give proofs of thrift and foresight than among the population at large.

Here we have to leave the carefully corrected birth-rates supplied by Dr. Newsholme, and fall back upon evidence which is statistically less perfect. . . . But it so happens that we do possess, over a term of nearly forty years, the number of children born in one large sample of the population, selected, it might almost be said, solely by the characteristic of thrift. The Hearts of Oak Friendly Society, the largest centralized benefit society in the Kingdom, has now over 272,000 adult male members. This membership belongs to all parts of the United Kingdom, of which it may be said to represent about 3 per cent., or no inconsiderable sample. No one is admitted who is not of good character and in receipt of wages at least 24*s.* per week. . . . The society consists, in fact, of the artisan and skilled mechanic class with some intermixture of the small shopkeeper and others who have risen into the lower middle class. Among its provisions is the "lying-in benefit," a payment of 30*s.* for each confinement of a member's wife. Unfortunately, we do not know either the relative proportions of the members who are married or the average age of the wives. There is, however, no reason to think that the proportion of married members has appreciably changed, whilst it is believed that the average age of the members as a whole has risen from about 33 to 37.52; and it may possibly be inferred that there is a corresponding increase in the average age of the wives. Judging from the evidence of the Scottish census of 1855, we might in such an event have expected a falling off in the births, due to this assumed difference of age, of at most 15 per cent. Now, what are the facts? From 1866 to 1880 the proportion of lying-in claims to membership rose slowly from 2,176 to 2,472 per 10,000. From 1881 to 1904 it continuously declined, until in the latter year it reached only 1,165 per 10,000 members. The birth-rate among this population of a million and a quarter persons, distinguished from the rest, so far as is known, only by one common characteristic, that of thrift, has fallen off between 1881 and 1901 by no less than 46 per cent., or a decline nearly three times as great as that during the same period in England and Wales. Taking the whole period of decline, from 1880 down to the latest year for which I have the statistics, 1904, the falling off is over 52 per cent.

A smaller society, the Royal Standard Benefit Society, having 8,225 members and giving a similar benefit, shows similar results. Between 1881 and 1901 the proportion of members claiming the lying-in benefit fell off by more than 56 per cent. If the members of the Hearts of Oak Friendly Society and the Royal Standard Benefit Society had had proportionately as many births in 1904 as the members of 1880 had in that year, there would have been born to them nearly 70,000 babies instead of 32,000. If the birth-rate in these 280,000 families of comparatively prosperous artisans had only fallen in the same degree as that of England and Wales generally, there would have been born to them 58,000 babies instead of 32,000. What was the special influence in these exceptionally thrifty families that prevented the other babies being born?

6. The decline in the birth-rate is due to some new cause which was not appreciably operative fifty years ago. . . .

In 1851, as in 1901, it could have been inferred from a comparison of different districts in the metropolis that "the more cultured, the more prosperous, healthy, and thrifty classes of the community" were producing fewer children per marriage than the classes of lower social *status*. But, as regards London in 1851, Mr. Heron is "driven to almost certain conclusion that differences in the mean age of wives were amply sufficient . . . to account for the differential birth-rates of districts with divergent social *status*." The operating cause of a low birth-rate was, in fact, at that date, postponement of marriage. We know, however, from Dr. Newsholme's corrected birth-rates that no such cause as a greater postponement of marriage, with the corresponding rise in the age of the average wife, has anything to do with the decline in the birth-rate now recorded. This decline is due to some cause other than those that were appreciably in operation in 1851.

7. The decline in the birth-rate is principally, if not entirely, the result of deliberate volition in the regulation of the marriage state.

The reader can scarcely have read the foregoing statements without coming to the conclusion that the falling-off in the birth-rate, which has during the last twenty years deprived England and Wales of some two hundred thousand babies a year, is the result of deliberate intention on the part of the parents. . . .

We may add other evidence. Among the Roman Catholics in the United Kingdom any regulation of the marriage state is strongly forbidden, and has during recent years been made the subject of frequent, special animadversion, both privately and from the pulpit. It is significant that Ireland is the only part of the United Kingdom in which the birth-rate has not declined; that in Ireland itself it has

declined a little in semi-Protestant Belfast, and not at all in Roman Catholic Dublin; and that in the towns of Great Britain the decline is least in Liverpool, Salford, Manchester, and Glasgow,—towns in which the proportion of Roman Catholics is considerable. All this is inconsistent with the hypothesis that the decline is due to physical degeneracy, and consistent with that of its being due to deliberate volition. Common report that such deliberate regulation of the marriage state . . . has become widely prevalent during the past quarter of a century—exactly the period of the decline—reaches us from all sides,—from doctors and chemists, from the officers of friendly societies and philanthropists working among the poor. . . .

The conclusions reached by Mr. Webb are practically the same as those already noted in the articles under discussion, but they are supported by some new evidence, and are given added significance by the indorsement of a man of such wide experience and profound knowledge of social and economic conditions in England. In a second letter Mr. Webb presents still further evidence in support of his last point. This letter is not published in full, and the following extracts are from the summary which appeared in the *Times*, October 19:—

Mr. Sidney Webb, in his second article on this subject, gives the result of a voluntary census taken by the Fabian Society "from a sufficiently large number of married people who could be relied upon to give frank and truthful answers to a detailed interrogatory. For this information resort was had to between 600 and 700 persons, from whom the committee had grounds of hope that answers would be received. About half of these persons resided in the metropolitan area, the remainder being scattered sparsely over the rest of Great Britain. In social grade they included a most varied selection of occupations." One of the questions was whether any steps had been taken to limit the number of children.

In the result, "of the 316 marriages, 74 are returned as unlimited and 242 as limited." Mr. Webb continues:—

"If we take the decade 1890–99, which may be regarded as the typical period, we find that out of 120 marriages 107 are limited and 13 unlimited, whilst of these 13 five, and possibly six, were childless at the date of the return. *In this decade, therefore, only seven or possibly eight unlimited fertile marriages are reported out of a total of* 120.

"The confidential voluntary census thus taken is, of course, far too small to be in itself any proof of a wide-spread custom. But, taken in conjunction with the very extensive statistical evidence already adduced, it seems to me to complete the demonstration. We must, I think, now take it as proved that the principal, if not the sole, cause of the present continuous decline in the birth-rate in Great Britain is the deliberate regulation of the marriage state. . . . Nor is the practice confined to this country. . . . It is clear that the American-born inhabitants of New England, and perhaps throughout the whole of the Northern States, are rapidly following suit. The same phenomenon is clearly to be traced in the German Empire, especially in Saxony, Hamburg, and Berlin, but the German rural districts are as yet unaffected. The Roman Catholic population of Ireland (and of the British cities), as well as those of Canada and Austria, appear to be still almost untouched, but those of Belgium, Bavaria, and Italy, are beginning to follow in the footsteps of France." . . .

In the October 26th issue Karl Pearson has a letter, in which he corrects certain statements attributed to him by other correspondents and criticises some of the statistics by which Mr. Webb supports his conclusions, particularly those based on the Fabian census:—

I do not doubt the accuracy of Mr. Webb's figures, but I feel pretty convinced from data in my own possession that they are drawn largely from the "intellectuals," whether among the middle or better working classes. The Fabians have provided us for many years with instruction and amusement,—with ecnomists, essayists, and dramatists. It will be a great loss if the next generation has but few Fabians. But statistics drawn from their entourage do not apply to the nation at large. They only illustrate my third point,—that, unfortunately, the limitation is differential, and that ability too often goes childless. I have been for some years collecting statistics of the relative size of families to-day and a generation ago. I have endeavored to do this without bias of any kind by issuing schedules merely asking for the number of relatives in two generations, *i.e.*, the number of recorder's brothers and sisters, dead and alive, and of the parents' brothers and sisters. My collection is far from complete, but I think, so far as it goes, it may be placed against Mr. Webb's results,—not necessarily to contradict them, but to temper the conclusions which the Fabian census would induce some to draw. Mr. Heron has kindly reduced the data for me. All the marriages have lasted fifteen or more years.

All barren marriages are excluded. It is impossible to say whether such are limited or not. 1,205 marriages in all were dealt with. The average number of offspring in the recent marriages was 6.40, and in the parental marriages 6.68. The difference, less than one-third of a child, is small, but of course significant. Other statistics I have show me that about 13 per cent. of marriages are now childless. This would reduce the average number of children born, not necessarily living, in present-day marriages to about 5.6, possibly slightly more, as all 15-year marriages are not completed.

Do I set this 5.6 against Mr. Sidney Webb's 1.5? Not in the least. He has got his census taken in one stratum: mine is taken in another. What both censuses demonstrate is my point,—that the limitation is differential. And the great problem is whether limitation has not begun at the wrong end.

Mr. Pearson, in a later issue of the *Times* (November 2), in replying to a number of questions raised by another correspondent, reaffirms his essential agreement with Mr. Webb as follows, referring to the cause of the declining birth-rate:—

Mr. Sidney Webb believes it is largely volitional. So do I. Probably we differ as to the extent of its differential character. I think that the smallness of families is unfortunately largely correlated with good social *status*, by which I understand that the better citizens in health, ability, and craftsmanship, have to-day fewer children than the weak, dull, and improvident.

Other writers add their testimony, and in most cases signify their approval of both the methods and the results set forth in these articles. There is some criticism and disagreement on minor points, and yet we may feel convinced, I think, that what has hitherto been more or less of a general belief or vague impression is now supported by substantial proof in the form of accurate and well-tested statistics. Moreover, we may look for increased activity, for a time at least, in the gathering of data along these lines.

APPENDIX.

TABLE I.—Divisions of

		1 Standard Legitimate Birth-rate.	2 Factor for Correction of Crude Legitimate Birth-rate.	3 Crude Legitimate Birth-rate.	4 Corrected Legitimate Birth-rate.	5 Factor for Correction of Illegitimate Birth-rate.
England and Wales	1901	34.91	1	27.29	27.29	1
	1891	33.63	1.0381	30.1	31.25	1.055
	'81	34.34	1.0166	32.2	32.73	1.131
	'71	34.78	1.0037	33.0	33.12	1.142
	'61	34.95	0.9989	32.4	32.36	1.109
Selected urban counties*	1901	36.90	0.9461	28.75	27.20	0.985
	1881	36.79	0.9489	33.83	32.10	1.101
Selected rural counties	1901	29.68	1.1762	23.83	28.03	1.045
	1881	29.36	1.1890	28.67	34.09	1.184
All urban districts†	1901	36.40	0.9591	—	—	0.963
All rural districts	1901	29.98	1.1644	—	—	1.147
Scotland ‡§	1901	30.18	1.1567	27.36	31.65	0.944
	1881	29.57	1.1806	30.89	36.47	1.007
North Scotland §	1901	26.83	1.3011	24.54	31.93	0.922
	1881	25.89	1.3484	27.83	37.53	0.971
South Scotland	1901	32.35	1.0791	29.16	31.47	0.961
	1881	32.32	1.0801	33.16	35.82	1.035
Scotland N.	1901	20.04	1.7420	19.57	34.09	0.938
	1881	20.18	1.7299	22.68	39.23	0.924
Scotland N.W.	1901	20.53	1.7004	21.32	36.25	0.913
	1881	21.06	1.6576	24.72	40.98	0.915
Scotland S.W.	1901	33.92	1.0292	31.43	32.35	1.021
	1881	34.05	1.0253	35.06	35.95	1.095
Ireland	1901	22.05	1.5832	22.48	35.59	0.835
	1881	24.06	1.4510	23.84	34.59	0.938
Leinster	1901	23.15	1.5080	22.55	34.01	0.811
	1881	24.76	1.4099	23.96	33.78	0.890
Ulster	1901	23.80	1.4668	23.51	34.48	0.813
	1881	24.24	1.4402	23.78	34.25	0.863
Munster	1901	19.86	1.7578	21.82	38.36	0.851
	1881	23.00	1.5178	23.67	35.93	1.018
Connaught	1901	19.43	1.7967	21.14	37.98	0.919
	1881	24.22	1.4414	23.31	33.60	1.095

* The special urban counties and rural counties are two groups selected by the Registrar-General ("Annual Report," 1903, p. xliv), the first including the chief industrial centres, and comprising a population in 1903 of 18,039,289, the second comprising only a few unimportant towns, but with an aggregate population of 4,314,254. According to the Census Report the first group comprises 89 per cent. of its total population in urban districts, the second group 42 per cent. in urban districts. Many of the urban districts in the second group are doubtless only villages, while in the first group are many large as well as smaller towns.

† The population of all the urban districts of England and Wales in 1901 was 25,058,355, of all the rural districts 7,469 488.

APPENDIX.

UNITED KINGDOM.

6	7	8	9	10	11	12
Crude Illegitimate Birth-rate.	Corrected Illegitimate Birth-rate.	Crude Total Birth-rate.	Corrected Total Birth-rate.	Number per 1,000 of Total Population of		Wives Aged 15–45 per Cent. of all Females of same Age.
				Females Aged 15–45.	Wives Aged 15–45.	
1.12	1.12	28.41	28.41	249.7	117.0	46.8
1.3	1.37	31.4	32.62	237.6	111.8	47.1
1.7	1.92	33.9	34.65	230.6	113.3	49.1
2.0	2.28	35.0	35.40	230.7	114.5	49.6
2.2	2.44	34.6	34.80	235.3	115.6	49.1
1.11	1.09	29.86	28.29	257.1	122.4	47.6
1.63	1.79	35.46	33.89	240.9	120.4	50.0
1.30	1.36	25.13	29.39	229.8	102.8	44.8
1.87	2.21	30.54	36.30	211.4	99.3	47.0
—	—	—	—	258.9	121.1	46.8
—	—	—	—	218.6	102.9	47.1
1.83	1.73	29.19	33.38	242.1	101.6	42.0
2.80	2.82	33.69	39.29	230.7	98.9	42.9
1.94	1.79	26.48	33.72	236.3	92.3	39.1
2.91	2.83	30.74	40.36	225.2	88.5	39.3
1.76	1.69	30.92	33.16	245.8	107.7	43.8
2.72	2.82	35.88	38.64	234.9	106.7	45.4
1.37	1.29	20.94	35.38	213.7	72.2	33.8
1.81	1.67	24.49	40.90	215.1	71.5	33.2
1.32	1.21	22.64	37.46	220.2	74.9	34.0
1.70	1.56	26.42	42.54	219.7	74.7	34.0
1.69	1.73	33.12	34.08	241.8	111.8	46.2
2.59	2.84	37.65	38.79	232.8	111.6	47.9
0.59	0.49	23.07	36.08	235.4	76.5	32.5
0.62	0.58	24.46	35.17	225.1	83.6	37.1
0.61	0.49	23.16	34.50	243.4	79.7	32.7
0.54	0.48	24.50	34.26	234.7	85.6	36.5
0.82	0.67	24.33	35.15	244.4	81.2	33.2
1.02	0.88	24.80	35.13	237.4	83.7	35.2
0.52	0.44	22.34	38.80	226.2	70.3	31.1
0.43	0.44	24.10	36.37	211.4	81.0	38.3
0.11	0.10	21.25	38.08	214.2	69.8	32.6
0.19	0.21	23.50	33.81	205.5	84.3	41.0

‡ All the recent Scottish birth-rates are for 1902, all others for 1903.

§ Scotland is divided for registration purposes into eight divisions, termed Scotland N., Scotland N.W., etc. The three northern and two midland divisions make up North Scotland, and the three southern South Scotland. The statistics for these two main divisions of Scotland are given first in the table, then follow statistics for three of the subdivisions, which have been selected from the eight as likely to show the greatest extremes of birth-rates. Of these Scotland N. includes the counties of Orkney, Shetland, Caithness, and Sunderland; Scotland N.W. includes Ross and Cromarty and Inverness; and Scotland S.W. includes Renfrew, Ayr, and Lanark.